COOP'S SATELLITE DIGEST

JULY 1983

TOP OF THE MONTH

WHILE many will be reading this immediately after returning from a 'big gathering' at the STTI Can/Am '83 show in Minneapolis, there is a report in this issue dealing with a much smaller gathering. Fewer than two dozen industry participants gathered in Boca Grande, Florida in mid-May to spend several days discussing pressing industry problems, and trying to get a handle on receiver testing parameters. A report in this issue.

THE FCC decision to shove 4 GHz birds as close together as 2 degrees has many people very upset. The bottom line appears to be that using conventional feeds and dishes, anyone with a reflector size smaller than 10 feet is headed for bad problems; and some of the 10 footers may not make the grade either. In this issue, a hard look at what the new tighter-orbit-belt spacings mean, and who is likely to get hurt.

THOSE who would sell TVRO hardware off-shore have a new problem; the U.S. Department of Commerce is pushing 'Operation Exodus', a plan to slow down the export of TVRO hardware. Coop comments on this latest problem, and, tells the sad but true story of a man who wanted to be the 'Satellite King' of Liberia in his comments section this month.

FINALLY, there have been several new antennas down on the Provo antenna test range during the past 45 days; **CSD** looks at some of these in this issue, and notes that more and more emphasis seems to be apparent in the pre-production engineering for new antenna models. And, gain is getting more impressive all of the time.

JULY 1983

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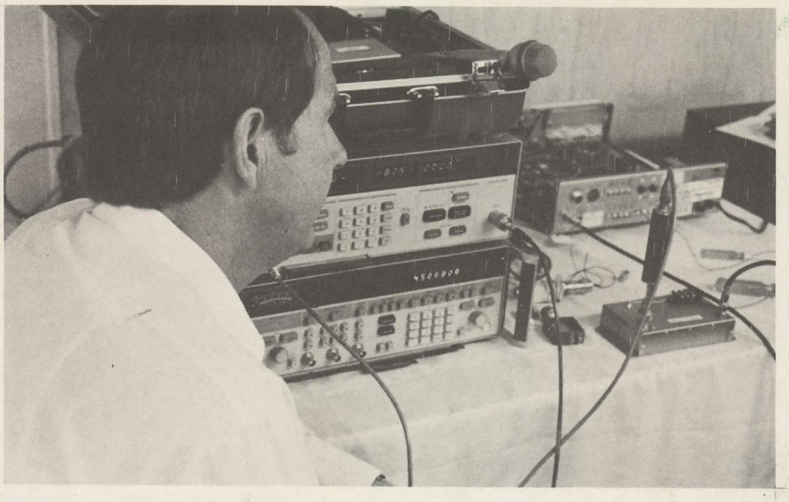

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OUR COVER — Canadian receiver design innovator **Jon Spisar** holds a full set of gold-metalized 'precious parts' to a 12 GHz (Ku Band) TVRO receiver in his hand. There's a complete 12 GHz receiver plus LNA in the container, which he shared with fellow members of **'ROBS'** at Boca Grande, Florida recently (see page **32).**

COOP'S SATELLITE DIGEST

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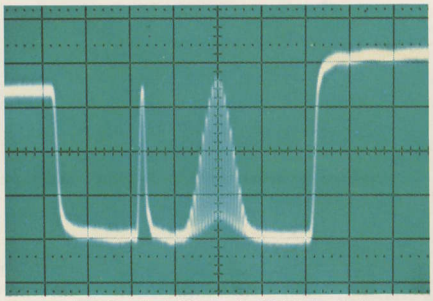

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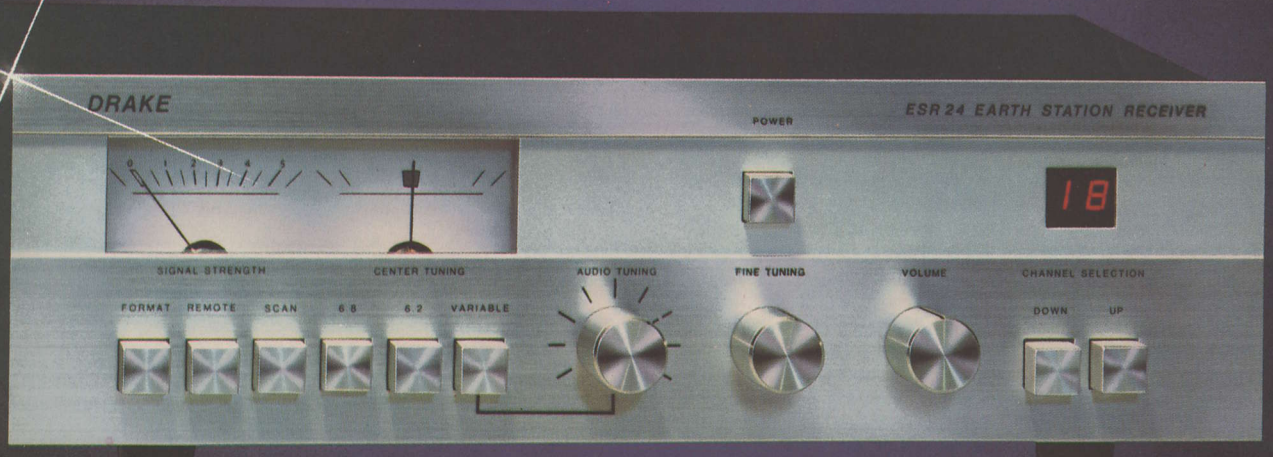

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COOP'S SATELLITE COMMENT

- 'Operation EXODUS' Closes In
- 'Satellite King' of LIBERIA

BOY/ARE WE In Hot Water

For several years now we have been encouraging people to haul TVRO hardware **out of** the United States and into nearby areas such as the Caribbean (etc) to expand our sales base into foreign countries. We've written about this a great deal, warning those who would engage in such activities that there are dangers involved; dangers with hauling 'high technology' equipment **into places** where perhaps the local governing regimes are not ready for CNN2 or even PTL.

And for several years now we have followed that intrepid traveler, Bob Behar of HERO Communications, around the globe (literally) as he has opened up continent after continent for 'first-time-ever' private TVROs. What we didn't know, until very recently, was that we might be encouraging people to break a U.S. law.

It seems that if you engage in the export of commodities there are certain licenses you MUST obtain prior to shipping the goods. For most of what might be shipped in general commerce, the exporting papers are simplistic and straight forward to complete, and typically prepared by the freight forwarding agent you have engaged to handle the transaction. **You know** that **you** do not understand how to ship a 12 foot antenna to Tanzania, for example, so you contact somebody who does. They tell you how to crate the shipment, how to 'document' the shipment with papers, how much the shipment will cost you, and where to have it delivered, and when. It's what they may **not tell you** that can hurt.

Now it seems that the United States is engaged in a 'technology war' with various foreign powers. There are certain things we know how to do better here which the United States government has decided is better kept 'at home'. We know how to build desk top or personal computers, for example, better than anyplace else in the world. And since an Apple II computer might be used for such unfriendly acts as programming a nuclear fusion reactor, the U.S. government has put technology such as the Apple II onto a list of 'high technology' items. All of the items on this list cannot be simply exported. Not by following the standard export procedures, anyhow.

Now it happens that way back in 1968 or so the United States Congress directed the United States Department of Commerce to create a list of goods and materials which the DOC considered 'high technology'. Congress also told the DOC to set up procedures whereby anyone who produced such goods could not export those goods outside of the USA (Canada is the only exception to what follows) without a special 'license'.

The reasoning, of Congress, was that the exportation of items on this 'high technology' list might endanger 'National Security'. Allow me to quote to you a single entry on this very long list. This entry tells you about an item which cannot be exported without this special export license; and that includes, as we shall see, approval from Washington.

"1520A/Radio relay communications equipment designed for use at frequencies exceeding 960 MHz, and components, accessories and sub-assemblies therefor. . .".

Now you might read this and say "So what does this have to do with a TVRO terminal". I'll tell you what it has to do with a TVRO terminal. This brief description of 'high technology goods' which cannot be exported without a special license describes a TVRO terminal.

You might try to argue that a metal reflector, especially one with no feed, is not

(1) high technology, and,

(2) frequency sensitive.

You might try to argue that a polarization rotation system is not high technology.

You might try to argue that much of what we now use comes into the U.S. from Canada, or Mexico or the Far East and when we ship it out, we are simply returning it to the world market from whence it came.

None of this will go any good. The Department of Commerce, in its infinite wisdom, has ruled that anything that has to do with a TVRO is 'high technology'; and, you may not ship it outside of the U.S.A. without the appropriate export license.

If you figure that is just another sheet ot two of paper, you are partially correct. But there is more to it than that.

You must apply for this special export license before you ship the goods. In fact, **CSD** learned that you should allow 45 days for approval for any shipment that is going to:

(1) Some place you have not shipped previously, or,

(2) Include goods (products, devices) which you have not previously asked for approval to ship.

In other words, you have to anticipate by 45 days to 60 days the shipping of every order going to someplace outside of the U.S.A. or Canada, and you have to complete and file the request for an export license that far in front. References on who to contact, for what assistance, follows.

Now let's suppose you don't bother to do this. Let's see what the DOC and the balance of the federal authorities are prepared to do to you.

(1) Let's assume the worst possible situation first; you 'lie' about the contents of a shipment. Let's assume you call the shipment 'washing machine parts'. Let's also assume you were trying to be clever and you packed the antenna, or receiver, or LNA or whatever in a box that did not have the word 'satellite' anyplace on it.

So you ship it merrily off to the freight forwarding company and he takes you at your word and proceeds to ship out your 'washing machine parts' to some guy in Ethiopia. Only along comes an Inspector from the U.S. Customs Department and he decides to see what your washing machine parts look like.

Ooops.

Once inside the container he immediately knows these are **not washing machine parts.** Your telephone will ring, or you will look up from your desk to be face to face with a shiny metal badge announcing the Customs Inspector. You may wish the guy was from IRS before you get done.

Let me tell you why.

The first thing they have the right to do is to confiscate your shipment. Lock it up. The next thing they have the right to do is to levy a 'fine' against you. Now if you were simply 'sloppy' in calling that TVRO system 'washing machine parts', and they believe that you were simply sloppy, the fine cannot exceed the U.S. value of the shipment. A $10,000 shipment; a $10,000 fine.

On the other hand, if they decide that you attempted to beat the regulations 'with malice', they can fine you far more than this.

For example. A well known industry supplier was shipping some large antennas plus electronics to a Middle Eastern country. The

custom guys got into the shipment and found that no special export papers had been obtained. They immediately yanked the $65,000 shipment away from the freight forwarding company. Then they went to the OEM and told him what they had done. A cash 'bond' totaling more than $11,000 was requested. **Instantly.** It was a case of 'pay it or lose the shipment, forever'. The OEM paid the bond/fine. Now he had to go to work to get the goods back, and shipped.

First he had to petition the Department of Commerce. The 'petition' is a lengthy legal document, prepared by an attorney, which explains (or tries to explain) why this shipment ended up in the hands of the freight forwarder without the proper papers atached. As I write this the clock is running on this case, which began in mid-May. The shipment is tied up by the Customs people. The $11,000 plus is in their hands. Large legal bills are piling up, and naturally the OEM is not going to get paid for the shipment until it is on its way. We'll come back to all of this shortly.

For example. Recently a shipment of TVRO electronics was being shipped by a large, well known CATV/broadcaster type OEM. The shipment crossed the border at Laredo, Texas and was actually in Laredo, Mexico when the U.S. Customs people discovered that inside the shipment was some 'high technology' TVRO gear. They got into a truck, **drove across the Mexican border,** and brought the shipment back into the USA. And locked it up.

In this case the papers had been filed, and they supposedly had been approved. Only as the shipment went from Laredo to Laredo, the papers were not attached. They were hung up someplace in the Department of Commerce. That's all it took. The electronics sat in a Customs warehouse in Laredo for several weeks while the manufacturer had everyone from his Washington attorney to his U.S. Senator working on the case. The shipment was eventually released. But the cost was significant.

Although all of this originates in a 1968 Act of Congress, it has new meaning these days because the U.S. Department of Commerce has decided to 'crack down' on the exportation of 'high technology' stuff. They have even assigned a special group of Customs Agents to the project, and they have given it a name. It is called **"Operation Exodus"** and the DOC and Customs people are deadly serious.

An LNA, stuck into a briefcase, is being illegally transported if it leaves the USA without the appropriate paperwork. That's the paperwork that requires 45 to 60 days to clear. A TVRO receiver? Same problem. A TVRO antenna? Same problem. Even if it won't fit into your briefcase!

About four months ago when 'Operation Exodus' got rolling, the Customs people sent agents around to meet with freight forwarding companies, freight shippers, and even OEMs. **CSD** made a number of random calls to shippers that specialize in overseas shipments in mid-May and found only two out of 8 selected from coast to coast who did not recall being visited by, and warned by, Customs agents. In particular, 'Satellite TV Equipment' was singled out; or so several shippers told us.

One OEM we talked with reported that when Customs agents visited the plant, they explained 'Operation Exodus' to them and then asked their cooperation. Specifically, the OEM was asked to call Customs if they noticed some strange products being ordered by inland folks; such as a Colorado address ordering TVRO receivers that operate only on 220 VAC, and/or bought for 'Intelsat' one-half transponder specifications. The Customs guys warned this OEM that there was a fair amount of 'repackaging' and 'relabeling' going on 'inland' by people who were shipping an unusually heavy amount of 'washing machine parts' to Africa or the Caribbean or wherever. They were determined, they said, to crack down on this activity.

One can allow his mind to wander to find some rationale reason why an overtaxed Department of Commerce and an understaffed Customs Bureau is suddenly spending much manpower and effort on cracking down on the shipment of TVRO hardware overseas. Since I have the distinction of being the editor for the industry's trade magazine, I have the ability to share my own 'mind wanderings' with you in this instance.

I suspect, **but have no proof,** that COMSAT or in particular Intelsat is behind all of this. We all know, from authenticated reports originating in Ecuador, Venezuela and elsewhere, that there has been pressure applied to various South American governments to stop the **importation** of TVROs. That pressure has come from the Intelsat gang. If they are not above applying pressure on the **importation** of TVRO hardware, one must also assume they are not above applying pressure to the U.S. government to stop the **exportation** of hardware. Like I said, I couldn't prove this, but I have my suspicions.

So we are in hot water. So are the freight forwarding firms if they continue to accept shipments which contain TVRO hardware (and, they know it contains TVRO hardware) and they ship them on outside the U.S.A., without the appropriate export license papers attached. Which leaves us where?

All of this builds into the advance time to be allowed for export paper preparation. Courtesy of **Doug Dehnert** of the United Satellite Systems, we have advice for those who find all of this very disturbing. Doug's firm has been routinely preparing these papers for quite some time now and Doug reports that while the routine is time consuming, it is not something to be feared. Doug's advice appears here separately.

In checking with other exporters of TVRO hardware, we learned that you should allow a minimum of 45 days for the approval of a shipment. Sixty days would be better, especially if this is the first time you have shipped into a new area, or you are shipping something which has not been previously shipped (outside of the USA/Canada). Can you shorten the procedure? Yes, and, no.

There are provisions for obtaining an **emergency** 'Export License'. But the requirements are stiff, and at least one supplier told us that the government frowns on granting more than one 'emergency' Export License to a single firm more often than every 30 days. In other words, you can't march in with every shipment an emergency.

A true emergency, and you will have to document the nature and details of the emergency, can get you approvals within a week. But you'll have to know who to go to in Washington, and have the Export License 'walked through' the appropriate places inhand, as it were, to get five day treatment. That says you will spend $400 or so to hire a 'gun' in DC to do the walking through for you for a true emergency. Once you know the ropes, you may even be able to do it by telephone and FED X shipping of the forms; but don't count on it.

What is an emergency? First of all, they better know who you are and have a file 'history' on you in place. Otherwise you can pretty well forget about an emergency Export License. A TVRO that is 'down', requiring an emergency receiver or LNA to get it back operating **might** qualify. "The 747 is coming . . . ." probably would not qualify. Like any other 'game' played in Washington, experience counts and knowing which string to yank or the proper chain to pull will come only by experience.

Operation Exodus is here. Customs fellows have a 'new charter' and they are determined to crack down on abuses of this previously little known regulation. Like it or not, what we have in our hands is

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Anyone who is shipping overseas is advised to write the Office of Export Administration, P.O. Box 273, Washington, D.C. 20044. Request a suitable stack of copies of the sextuplicate form **ITA-622P; Application for Export License.** To give you assistance, we urge that you contact Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 and request subscription information to the **'Export Administration Regulations'** including the **'Export Administration Bulletins'.** Most of the information required, while tedious to complete, is straightforward. Item 14 calls for you to spell out 'Foreign Availability' of the commodity/commodities you are seeking to export. Here the DOC wants to be assured that what you are exporting is not an 'American secret'. One way to handle this is to provide, as attachments, data sheets from off-shore produced products thereby signaling DOC that you are simply shipping an American version of something already available in international commerce. Finally, item 12 asks for you to explain the 'specific use' of the commodities or technical data, by the person/firm you are shipping to. Don't be cute. Don't mention Ghorizont. Don't mention HBO or telecommunications. Just stick to the basic description of satellite television reception and stay **away from** anything specific; such as, 'To receive US pay television service in Surinam'!

COOP/continues page 82

WHEN YOU ARE THE A

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Hero System 25-H - 7.5 Meter
Motorized Antenna

ANTENNA SPECIFICATIONS:

ELECTRICAL:	3 METER	4 METER	5 METER	6 METER	7.56 METER
Operating Frequency	3.7 to 4.2 GHz	3.7 to 4.2 GHz	3.7 to 4.2 GHz	3.7 to 4.2 GHz	3.7 to 4.2 GHz
Antenna Gain at 4 GHz	40.4 db	42.8 db	44.5 db	46.5 db	48.4 db
Beam Width (-3 db)	1.75°	1.33°	1.°	.8°	.7°
First Side Lobe Exceeds FCC	32-25 Log 0	32.25 Log 0	32-25 Log 0	32-25 Log 0	32-25 Log 0
G/T at 20° Elevation (with 100°K LNA)	21.04 db	22.06 db	24.08 db	25.7 db	27.6 db
F/D Radio	0.30	.30	0.375	0.375	0.365

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ANALYSIS

TWO DEGREES / OUCH!

SOONER Than Later

The recent, May 1983 issue of **CSD,** spent some time looking at the new generation of six foot dishes, and the various techniques being utilized by those marketing such small systems to increase the market penetration for home TVROs. The same May issue carried a premature report dealing with the FCC's long expected pronouncement concerning re-assignment of bird Clarke orbit (geo-stationary) positions in the sky above the equator. One seemed to support the other, when we noted on page 52 ". . . those worrying about usefulness of 6 and 8 foot home dishes in immediate future need not worry, 1990 seems a long ways away." This provoked at least one reader (Dan Phillips of the Southern Baptist Convention) to write "For the first time as 'TVRO prophet par excellence' you have been caught with your pants down."

Phillips went on to note "The FCC's new two degree spacing procedure is going to have an almost immediate effect on many of us. **Goodbye to six foot dishes.**"

Maybe yes, maybe no. And if maybe yes, perhaps not for the reasons cited. This is a hard look at not only the FCC's two degree spacing decree, but also at some other factors which may, in the near term, have a more direct impact on six and eight foot dishes than the ultimate FCC game plan to recarve up the Clarke orbit belt.

WHAT Was Done

Way back early in Fall of 1981, the FCC said it was studying the possibility of creating additional space in the sky by forcing existing and future satellites (at both the present 4 GHz 'C Band' and the coming 12 GHz 'Ku Band') to move closer together. That seems like a reasonable approach on the surface since the Clarke (geo-stationary) orbit belt is a finite resource. Farmers have been doing that sort of thing for years; they call it 'inter-cropping.' Between their rows of corn they plant rows of some other compatible crop. With the proper equipment, both crops mature and are harvested from the same plot of land. The key here, as with the satellite 'crop in the sky,' is having the proper equipment.

When the satellites are moved closer together than their present 4 degree spacing, additional 'slots' are created in the sky for additional, new, satellites. The 4 degree spacing really began as an American plan to subvert a 1969 decision formed at the international level; one that suggested that all satellites operating within a specific frequency band (such as 4 GHz) should be **5 degrees apart** in the sky. As most readers know, satellites are assigned parking spots directly above the equator at an altitude of approximately 22,300 miles. The satellites are 'identified' by their location; the spot in the sky where they sit is related to the longitude of the spot on earth above which they rest. 0 degrees longitude is the so-called prime meridian that passes through Greenwich, England and other locations are identified by degrees east (east of Greenwich) and degrees west (west of Greenwich). A satellite located at 80 west is actually located directly above the equator, almost squarely above Quito, Ecuador.

The 1969 era decision to space satellites at locations along and above the equator, at 5 degree intervals, would have created 'space' in space for 360 degrees divided by 5 degree intervals, or 72 separate birds operating at 4 GHz. That's around the full world.

However, the same 1969 'accord' also created 'cluster sites' at three different locations above the world where those international class satellites, Intelsat birds (and later Russian Ghorizont birds), would be 'protected' from interference by non-Intelsat birds. These clusters are roughly grouped around 20 west, 180 west/east, and 60 east. Respectively, they serve as 'protected zones' where Intelsat class satellites can operate to serve Europe/Africa/South America/North America, and, the Pacific/Asia/North America, and, Africa, parts of Europe, parts of Asia, and parts of the Pacific. Inspite of the original 5 degree spacing agreement, Intelsat took it upon itself to treat those cluster zones as 'sub-assignments' within which **it could re-assign** its own birds as its own needs dictated.

When Canada launched the first ANIK (A) bird, and Western Union launched the first US (WESTAR I) bird, there was plenty of room in the sky for them to locate. Canada and the US had worked out an agreement which sub-divided that portion of the orbit arc which seemed to have the best 'field of view' to serve, respectively, Canada and the USA. The USA portion would extend initially from 80 west to 140 west, with a chunk between 99 and 119 left open for Canada.

Canada's problem was that it extends well north of the Arctic circle, and because the earth is curved like a ball, you can get too far north to 'see' **any satellites** located even at the monstrous height of 22,300 miles above the equator. The curvature of the earth simply gets in the way, and satellite signals don't bend around the curve of the earth. So Canada got the first selection of spots which was important if those far northern Canadian sites were to have any potential satellite connected communications. It turned out that the US also had a similar problem, with Alaska, but the most opportune location for Alaskan birds would be due south of Alaska, which fortunately was not the proper location for Canadian birds. So everyone was more or less happy with the arrangement.

And then the satellite explosion hit. The first impact of the explosion fell on the cable television industry. Starting off with a single HBO channel in September of 1975, it was only a matter of years before the cable industry had so adopted satellite programming that the industry was filling up up to 22 transponders on a 24 channel bird and they would have gladly taken the remaining two if RCA would let them do so. RCA tried to launch a new satellite (F3) in December of 1979 to provide the cable industry with growth room; and that satellite was lost during the launch phase. That left the cable industry, ready with perhaps another dozen or so new, additional, program channels, virtually shut off from additional growth for a couple of years.

This 'crunch' on available transponder space sent the participants in several different directions. Some wandered about the Westar/Comstar birds looking for a home. None were ever very satisfied with their interim quarters since the cable system operators knew that the temporary Westar/Comstar homes were indeed temporary; and the cable system operators were not that anxious to spend big bucks for whole new satellite antenna systems to bring in a few additional channels that would, one day, move to a new, 'permanent cable bird' anyhow.

Still others took their first, hard look at all of the then-planned new

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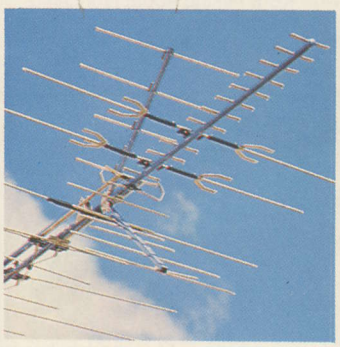
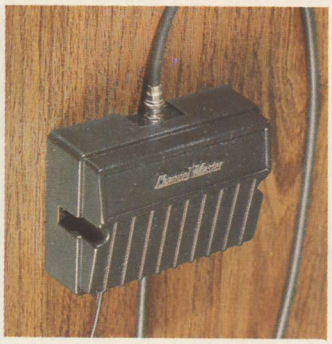

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They're the people in over 8 million American homes with a Channel Master antenna rotor control box in their living room. They're some of the users of the 21 million Channel Master outdoor TV antennas sold over the last 34 years. **Some of our competitor's names may be well known to us in the satellite "trade" but to the average consumer they mean absolutely nothing.**

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satellites, and they tried to figure out just how many transponders the cable industry, and others, would really need in say 1985, or 1990. That proved an exercise in futility since there was no good data available on what types of groups, or broadcasters, or cablecasters might emerge as viable business entities and indeed, for their own use, require a full or part transponder on a regular basis. But the handwriting and the trails all seemed to point in one direction; during the 1980s there would be a far larger demand for transponders than there would be transponders. And that caused several groups to decide that they wanted to be satellite operators.

Which brought the inevitable result; more firms filed formal requests with the FCC to build, launch and operate 4 GHz satellites than there were spaces in the sky. In other words, at the then-in-effect 4 degree spacing plan, if every firm that asked to be a satellite operator was approved by the FCC, there wouldn't be enough space to accommodate them all.

It didn't take the FCC very long to figure that one out. And when they heard rumblings from the established satellite operators (RCA, Western Union, Comsat) that they would be requesting new, additional 'orbit spots' themselves for new additional satellites, it all looked like an entire new approach would be required to make room for everyone.

Which brings us to the fall of 1981 and the flotation at the FCC of the concept of reassigning the then-in-effect orbital parking space assignments. The Commission put a study group on the problem, and the study group came back with a recommendation; by assigning the orbital locations in 2 degree, rather than 4 degree, increments, approximately twice as many satellites could be placed into service. And that was in December of 1981. The matter has maintained a relatively low profile at the FCC in the interim 16 months. Every now and again, somebody at the Commission would make a comment on the progress of the proposal, just to let us know they were still thinking about it. And then, in January of this year, the 'remarks' became more frequent, and detailed. **A decision was coming.**

In matters of policy or rule change, the Commission typically finds it must follow administrative procedures which are designed to insure that the 'public' has an opportunity to voice their feelings. The 'public' seldom comments, but the directly affected parties do. Thus we have a scenario where those who would be impacted by the proposed 2 degree spacing sit down with their own 'experts' and they work out all of the ways they will be 'hurt,' or 'helped,' by the proposal. Then they put this all down on paper, and they attempt to support their 'bottom line' 'for' or 'against' position by citing past FCC actions, or court rulings, or special studies they conduct to help their position. Some of the filings, made to the Commission in a situation such as this, run to hundreds of pages of carefully chosen words, backed by hundreds of additional pages of support documents. And somebody with the intelligence to understand all that has been filed with them on this matter, at the Commission, has to plow through all of these comments. And try to work out of the conflicting comments received some consensus of opinion.

Some proposals, such as one floated years and years ago, to move all television to the UHF broadcasting channels (vacating VHF in favor of two-way radio), are doomed from the start. Those who are 'agin' are simply too strong, politically, to allow something like that to happen. Other proposals, such as the 2 degree orbital spacing plan, are guaranteed to pass from the start. The only question remaining, once the FCC announces a proposal to do something like this, is 'when,' and possibly 'where.'

When the FCC proposed 2 degree spacing, there were mild tremors in the earth station industry. Notice we said the **earth station industry,** not the home TVRO industry. In particular, there was concern with the radio network systems (now largely converted to satellite, and heavily dependent upon ten foot size dishes) and the cable industry (which today uses many 10 and 12 foot size antennas, especially on those services spread over F4, W4 and W5), and to some surprise, the uplink operators who feed programs to the satellites. But, significantly, there was not a battle roar of protest. The Commission read that as a positive sign. Now all they had to do was to await the appropriate moment to formalize their initial decision. They'd wait at least a year, just to give the decision making process the appearance of being well studied and carefully worked out. That same year would allow those many firms who were talking about launching new satellites to get their own acts in better shape as well. In a year or so, the whole picture would be much clearer.

For a short period of time, there were genuine concerns about whether or not two phases of the presently constructed satellite industry (all of the industry) could continue to function at 2 degree spacing.

1) Unknown were the antenna pattern characteristics of many of the then-in-use three meter (10 feet) or 3.7 meter (12 feet) antennas in service in the **radio network** ARO systems, or the **cable network** TVRO systems. There was a flurry of technical articles in print which alternately 'proved' that 3.0 and 3.7 meter antennas would, and would not, work at 2 degree spacing.

The technical articles, prepared typically by leading professional antenna manufacturers, usually came to the conclusion that 2 degree spacing was viable if the users were willing to accept slightly more 'interference' from adjacent satellites, and if there was some common sense applied to which satellites were allowed to 'sit' next to one another. We'll revisit that again before we are done.

Some not so technical articles came out of places like the NCTA (National Cable Television Association) and they said, just as firmly, that 3.0 meter dishes were 'all in trouble' while many of the 3.7 meter dishes would find it tough going. The problem was that nobody debating this was really comparing apples and apples.

2) Equally unknown were the variations in frequency assignments that might be employed, or the variation in modulation formats that might be employed when satellites were adjacent to one another, and as close as 2 degrees.

Way back in 1976, when the FCC was seriously considering allowing cable systems (and others) to install dishes smaller than 9 meters in size (early FCC rules called for minimum dish size of 9 meters), IT&T, Antennas For Communications, Andrew and others then in the professional antenna manufacturing business devoted a considerable amount of antenna test range, and laboratory test measurement time to the question of 'interference.' At the time, the FCC ws not convinced that dishes smaller than 9 meters would work. They were concerned first that the received signals would be 'weak,' and second that with dishes as 'small as 4.5 meters or so' there could be interference from satellites spaced 4 degrees apart. ITT in particular spent thousands of hours and probably tens of thousands of dollars simulating satellite-to-satellite interference. From that study the Commission decided that the then-existing regulations, drawn from 1970 era Intelsat recommendations, were overkill.

Under the Intelsat recommended interference levels, if you had a dish pointed at Satellite 'A,' and that dish was picking up a signal from an adjacent satellite ('B') at a level of signal which was 27 dB or less weaker than the satellite 'A' signal, you were (by Intelsat standards) in deep trouble. ITT showed the Commission that a 27 dB interference standard was absurd; that in the case of video transmissions, in particular, even the most critical measurement could not detect the presence (i.e. see an indication) of 'degrading interference' unless the interfering signal was at least 18 dB lower in level than the desired signal level.

The same ITT study went further; it showed that if the interfering carrier level was below (reduced from) the desired carrier by 15 dB you have interference which was 'noticeable' by perhaps 10% of the observers. In fact, it took an interfering signal level of -12 dB (i.e. 12 dB weaker than the desired signal) before even 50% of the test observers found the interference 'objectionable.'

Now those were test results for video signals, on both satellites, interfering with one another. The same studies also revealed that if the lower level (interfering) signal was not a video signal at all, but a data or digital or SCPC signal, much higher levels of interference could be tolerated before the video signal was degraded. Going the other way, there were (however) situations of modulation format by which the digital/data/SCPC signals suffered badly when they were subjected to an adjacent satellite with a video modulated signal.

SPACE got into the act, even if only informally, as the Commission's study period was moving ahead. Under the chairmanship of SPACE's Taylor Howard, a study was prepared which purported to show that many (if indeed, not most) of the 3 meter (10 foot) antennas would continue to deliver 'adequate pictures' even with closer spaced satellites. Howard's study was largely built around then-existing

antenna feed systems and we'll see what impact feed systems have on system performance as it relates to close spaced satellites later on here.

The SPACE 'comments' were sort of a set of findings filed by 'an Ambassador without a country'; SPACE, in fact the entire 'home TVRO industry,' had absolutely **no legal status** in the proposed rule change whatsoever.

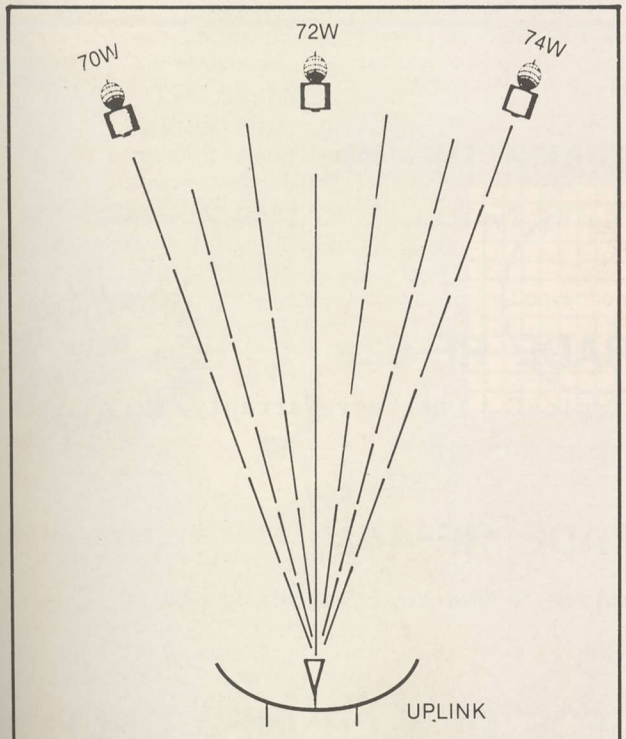
When the FCC came along in the fall of 1979 and decided that TVRO antennas no longer **had to have** FCC-granted licenses, they also ruled at the same time that if a person or a firm decided to install a TVRO/ARO without benefit of FCC license, that installation would have absolutely no legal standing before the Commission. In other words, if you wanted to be able to **protest** when somebody did something to you, you had to be a licensee of the Commission. By opting **not** to get a license, you were **giving up your legal rights** to be considered in any future actions of the Commission, or its licensees. SPACE, at that point in time, was new in the business and representing a group of people who were 'citizens without a country.' SPACE could have taken just about any position it wanted in this issue; and nobody at the Commission would have noticed.

Nobody worried about 'home TVROs' because home TVROs (with a few scattered exceptions) had no legal status.

And then there were the uplink operators; the people who transmit programming **to** the satellite. Most of these folks use relatively large 10 and 11 meter antennas; or in the cases of RCA and Western Union, antennas as large as 60 feet. But, there was a growing group of 'portable uplink' operators; people who hauled six meter and five meter and even 4.5 meter dishes around the countryside to provide instant uplinking of television worthy events. There were also a sizeable number of really small data and telephone link uplinks, antennas as small as 3 meters in size, feeding narrowband services to various Satcom and Westar satellites. How would they manage with birds spaced at 2 degrees?

To understand this problem, you have to realize that we have antennas on board the satellites which do two things; they transmit a relatively 'broad beamed' signal back to earth, and, they receive signals uplinked from earth. Since the ideal situation for a satellite is to have a receiving antenna on board that 'sees' the same wide, broad-beamed region that the downlink transmitting antenna sees, we have a problem. If an earth bound uplink antenna is pointing at a bird at say 72 west, and the beam width of the small uplink antenna is broader than it might be, there is going to be a sizeable amount of signal also going to adjacent birds at 70 and 74 west. That gives us a direct path, at reduced power level, to at least three birds at once. The aimed-for bird at 72 west gets sufficient signal for the satellite to send its material back to earth; and the adjacent birds at 70 and 74 receive sufficient 'sidelobe power' signal to also send the same signal back to earth.

Such sidelobe power signals were not intended for the birds at 70 and 74; they are not 'paying' to be a part of the systems at 70 and 74, and they will interfere with those that are a part of the systems at 70 and 74.



THE CLOSE-SPACED UPLINK PROBLEM. SATELLITES AT 2, 2.5 AND 3 DEGREE SPACINGS WILL RECEIVE "SIDELOBE" TRANSMITTED ENERGY FROM UNDER-SIZED UPLINKS.

WHEN THEY'LL Fill Up

Since so much of the unknown part of the 4 GHz close spacing scenario depends upon the likely operational dates for satellites yet to be launched, a timeable of likely launch and 'turn on' dates would be useful. All launches are based upon projected availability of new satellites, and launching vehicles. **Exact dates,** more than a month or so in advance, are impossible to pin-point.

Orbit Spot	Launch Date	Operational Date	Satellite	Type Operation
143W	Operating	Operating	SATCOM 5	Video, data (Alaska)
141	Unknown	Unknown	Unknown	Unknown
139	Operating	Operating	SATCOM 1R	Narrow band, data
137	Unknown	Unknown	Unknown	Unknown
134	June 1983	July 1983	GALAXY 1	Video
131	Operating	Operating	SATCOM 3R	Video
128	Sept. 1985	Nov. 1985	ASC1	Video, data
125	1984	1984	TS4(*)	Video, data
122	April 1984	May 1984	SN1	Video, data
119.5	Operating	Operating	W5(*)	Video
116.5	1985	1985	Mexico 1	Video, data
113.5	1986	1986	Mexico 2	Video, data
111.5	Operating	Operating	ANIK/2(*)	Data
108	Operating	Operating	ANIK/B(*)	Video, data
104.5	Operating	Operating	ANIK/D(*)	Video, data
101	Unknown	Unknown	Unknown	Unknown
98.5	Operating	Operating	W4(*)	Video, narrow band
96	Operating	Operating	D1/2(**)	Video, data
93.5	1984	1984	GALAXY 3	Narrow band
91	March 1985	April 1985	SN3	Unknown
88.5	Operating	Operating	D3(**)	Video, data
86	Operating	Operating	W3(***)	Video, data
83.5	Operating	Operating	SATCOM 4	Video, data
81	March 1986	April 1986	ASC2	Video, data
78.5	March 1984	April 1984	W6	Video, data
76	July 1983	August 1983	TS1	Video, data
74	Sept. 1983	October 1983	GALAXY 2	Narrow band
72	Aug. 1983	Sept. 1983	SATCOM 2R	Video, data
69	Sept. 1984	Oct. 1984	SN2	Unknown
67	May 1986	June 1986	SATCOM F6	Unknown

*—See present versus re-assignment table for bird position changes.

**—Comstar D series birds being replaced by TelStar birds.

***—Westar 3, last of 12 channel birds, eventually to be replaced with 24 channel bird.

CRUX Of The Problems

So there are at least two, distinct, problems involved when the bird to bird spacings tighten up. On the ground, antennas that are 'too

OOPS!/continues page 14

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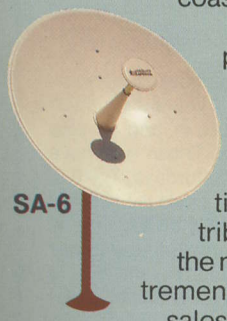
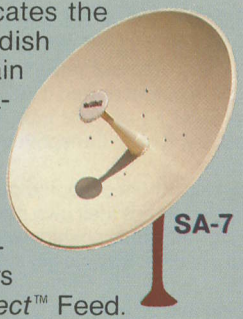
Dave Fedric—President, Satellite America (Satellite Digest 1981 Man of the Year)

Satellite America leads a new revolution in small dish antenna development. This major advancement has dramatically expanded our market by substantially reducing retail prices of quality satellite systems. Satellite America technology now makes it possible for small six- and seven-foot antennas to deliver quality video coast to coast.



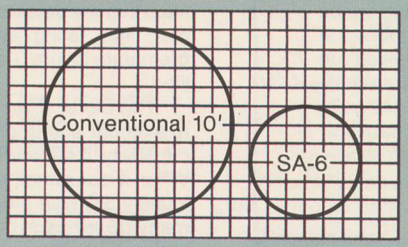
Because these pioneering developments by Satellite America have reduced equipment and installation costs, our distributors throughout the nation are enjoying tremendous increases in sales and profits.

Our SA-6, SA-7 and SA-10 antennas incorporate our new *DualReflect*™ Feed which relocates the LNA *behind* the dish where heat and rain are no longer major factors in system performance. Although competitors may try to copy it, only Satellite America offers the true *DualReflect*™ Feed.

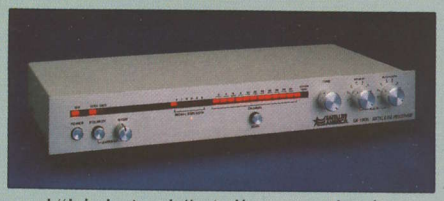


Our SA-6 and SA-7 antennas are of one-piece fiberglass construction with a special reflective surface that maximizes efficiency. Our SA-10 antenna is formed of eight thermo-compressed fiberglass panels that are perfectly matched for broadcast quality reception. The mounts on our SA-6, SA-7 and SA-10 offer similar improvements, making them the finest engineered and fabricated steel mounts available anywhere. For example, our new *PowerRing*™ on the SA-7 and SA-10 mounts includes a declination adjustment for the most precise and stable polar mount movement on the market.

The dramatic size reduction of our six-foot antenna compared to a ten-foot model is clearly shown in the graph. You can see why wind loading is reduced to a manageable level for most applications and why consumer acceptance is so much better.



Our receiver technology is just as exciting. Our innovative new SA-1000 receiver is the first of a new generation of satellite receivers to come from Satellite America. LED tuning, push button controls, stereo and "high-tech" styling are the ingredients making this the industry's finest value.



But products alone do not define our company. Our total concept of integrated marketing, advertising and logistical support sets Satellite America apart. In a few months, Satellite America has become one of the largest satellite system suppliers in the world. We believe we supply more satellite systems than anyone else in the U.S.A. and we know ours look the best.

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Dave Fedric, President

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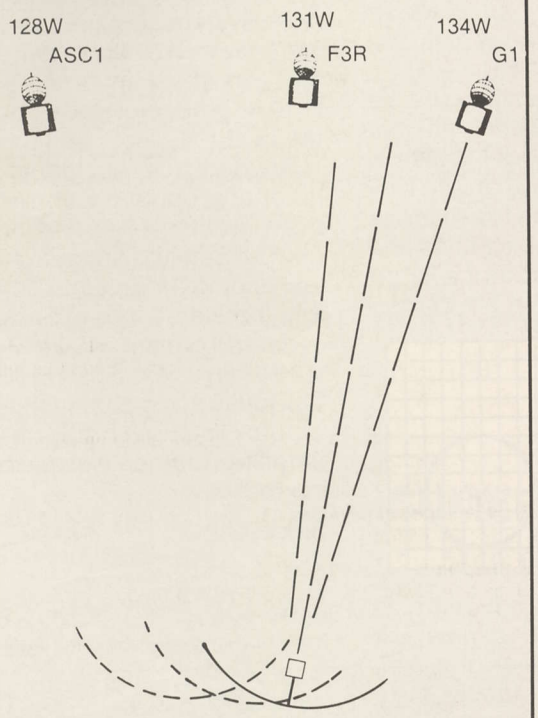
OOPS!/continued from page 11

small' (i.e. have too broad a beamwidth) will be subjected to interference signals from adjacent satellites. Just how much interference will depend upon a number of factors, including:

1) Whether the adjacent satellites are utilizing **'modulation formats'** on the same transponders at the same time which are 'compatible' with the desired signal, or 'different than' the desired signal.
2) The actual **beamwidth of the downlink antenna.** Just a few tenths of a degree improvement in beamwidth control might be sufficient to make a very large difference in interference levels. Fine tuning of antenna beamwidths will be quite a challenge.
3) The **stability of the dish on its mount.** Relatively lightweight antennas, the type often used for home TVRO reception, frequently are so designed that you can 'watch' the feed, or the entire dish, 'buffet' (oscillate) in the wind. Because the front beamwidth of the dish is relatively broad, this 'buffeting' may not translate to noticeable picture degradation with the present 4 degree spacing. However, when the birds are moved closer together, this buffeting will cause the beamwidth of the antenna to jump back and forth into the portion of the sky where the TVRO antenna sidelobes bounce into and out of the adjacent satellite signals. This will produce a 'pumping action' on the screen; interference that is there, and then gone, as a function of the oscillation rate of the antenna in the wind. Obviously, super secure, rock solid mounts and feed support systems must be developed.



ANTENNAS THAT BUFFET/OSCILLATE SIDE TO SIDE IN THE WIND WILL HAVE "COMES AND GOES" INTERFERENCE AS SIDELOBES WALK IN AND OUT OF ADJACENT BIRDS.

4) Motor drives and controllers that have a plus or minus 0.5 degree re-positioning accuracy will be a problem. **Precise re-aiming will be mandatory** since a slight mis-adjustment to the left or right will shift the beamwidth into one or the other adjacent satellites.

And those are the 'opener problems.' And they relate to antennas that 'might be big enough' to handle 2 or 2.5 degree spacing; say the present generation of 10, 11, and 12 foot antennas. We'll look at smaller antennas, separately, later on in this report.

ANOTHER, More Serious Problem?

As nasty as life may become in the years ahead when the spacings tighten up, there is a relatively good chance that many of the systems now being sold, with good performance, will be in big trouble **long before** the spacings get tight.

Old timers in the industry will recall that when RCA put F3R into service late in December of 1981, **CSD** asked readers to supply 'before' and 'after' signal level readings. From those reports we put together some coverage maps which depicted receive system performance over most of North America, plus areas of the Caribbean, Central America, and northern South America. We also did direct comparisons between F3R and F1, and we found that there had been 'signal level increases' of from 1 to 5 dB on various F3R transponders. Indirectly, those signal increases have led us to the present state of the industry where we have 6 to 9 foot antennas producing decent quality pictures in many areas. At the time we warned readers that all satellites deteriorate with age; that is, they gradually produce lower and lower output signal levels. And, since we are depending upon these "1 to 5 dB stronger" signal levels (F3R versus replaced F1) to make the smaller dish systems play, we have to be more concerned about satellite degradation now than we were in previous years. A 1 dB reduction in signal level on a 7 foot dish is far more noticeable than the same signal reduction on a properly designed 10 foot dish. It is just that simple.

F3R has now been in service approximately 18 months. Some of us with the proper equipment have been taking regular signal level measurements to plot the degradation now underway. The measurements to date paint a picture that is, on the short term, far more threatening to the viability of 'small dishes' than the ultimately closer spaced satellites.

Satellites lose available output power for a number of reasons. The most dramatic loss will typically occur in the first year during which time the downlink transmitter amplifier stages 'burn in' and develop individualized long-term operating characteristics. Those who have been watching the **Sat Scene** program on F3R (Saturdays, TR18, 2 PM eastern) will better understand how this works since we recently completed a videotape tour of the RCA uplink facility on that weekly program. RCA and others claim their individual transponder power amplifiers are 'flight rated'; a term that describes a burn-in and ground conditioning period all amplifiers are subjected to before being retrofitted into the satellite proper. At the very least, satellite builders hope that 'flight rating' amplifiers will cull out any that might develop a premature failure (i.e. quit) prior to the seven year minimum expected life.

Therefore, if an amplifier rated at 8.5 watts 'saturated power' (maximum output power) loses 1 dB of output transmission power capability, it will now become an approximately 7 watt power amplifier. When it loses another 1 dB of output power, it will become an approximately 5.6 watt amplifier. And so on. The trick is to know just how many dB, or parts of a dB, the typical transponder power amplifier is apt to degrade per year.

RCA, Western Union, and others of course monitor this factor on their own. They are not apt to release their own data, however, since it indirectly affects their long term relationships with their clients; the transponder users. There are other ways to get that data; you perform your own measurements.

One of the people doing this on a regular basis is Mike Gustafson of **Satellite Receiving Systems(*).** Mike is best known to industry people for his participation in STTI trade shows; he also was one of the duo (with Jack Trollman) involved in measuring TVRO antennas for gain back when STTI thought this was an important exercise at trade shows. Supporting Mike's precision measurements are those routinely taken here on Providenciales at the **CSD** Lab, and others taken less routinely by many in the field.

The Gustafson approach is to take all of the measured C/N (carrier to noise) readings for all of the transponders being monitored and 'average' those numbers for each satellite of interest. From this 'averaging' you can paint a picture of how the entire satellite (all transponders) are faring, as well as look at individual measurements for indi-

vidual transponders of interest.

Let's look at the measured degradation for RCA's F4 satellite first. This satellite began life as a very lightly loaded satellite. Even today it has far lower occupancy than other RCA satellites. Therefore we have less 'raw data' to work with, in comparing the 'soon-after-launch' transponder by transponder EIRPs, and today's effective received signal levels.

F4 Results

RCA's F4 bird, located at 83 degrees west, has an identical transponder configuration to F3R; 18 transponders operating at 5 watt (saturated) power level, and 6 transponders operating at 8.5 watts saturated power level. Both birds therefore have the following **power** line-up:

Transponder Bank 1 (8.5 watt) / boresighted CONUS only.

TR 3	SPN
7	NCN (daytimes); Playboy (nights)
11	Not in use
15	Biznet
19	American Hospital Network **(**)**
23	Occasional video

**** — The American Network moved to Westar 5, transponder 20, during June.**

Transponder Bank 2 (5 watt) / boresighted CONUS only.

4	Not in use
8	**Was** The Entertainment Channel
12	Not in use
16	Not in use
20	Not in use
24	Occasional video

Transponder Bank 3 (5 watt) / primary boresight CONUS

1	SIN
5	Not in use
9	Not in use
13	Not in use
17	Trinity (TBN)
21	Not in use

Transponder Bank 4 (5 watt) / primary boresight CONUS

2	FNN (daytimes); EROS (3 late nights)
6	BRAVO
10	Not in use
14	Not in use
18	HBO Data Test
22	Galavision

After the initial launch of F4, Gustafson found five transponders with regular signals. A year later the growth of F4 activity increased that to nine transponders. 1982 (April) and 1983 (March) data is shown.

Transponder	4/18/82 C/N	3/18/83 C/N
1	no data	9.7 dB
3	11.7 dB	11.4 dB
4	no data	9.5 dB
7	12.2 dB	11.3 dB
8	no data	9.2 dB
17	11.3 dB	10.9 dB
18	11.5 dB	10.7 dB
19	12.6 dB	11.5 dB
23	no data	12.2 dB
Average C/N	11.8 dB	10.7 dB

However, for the purpose of determining the output power loss over the full year of operation, only those transponders which were operational for the full year (beginning April 18, 1982) can be counted. This results in a new average of 11.2 dB. And this equates to a **one-year power-loss of 0.6 dB.** That number will come up again.

*** — Mike Gustafson, Satellite Receiving Systems, 1606 Capitancillos Dr., San Jose, Ca. 95120; (408) 268-3935.**

F3R Results

RCA's F3R bird was virtually fully operational on all 24 transponders from the day it came 'up' in late December of 1981. Only transponder 21 (The Weather Channel) was not operational during the February 1982 initial tests by Gustafson.

Transponder Bank 1 (8.5 watt) / boresighted CONUS only.

Transponder	Service	2/6/82 C/N	3/18/83 C/N
3	WGN	9.3 dB	8.3 dB (***)
7	ESPN	12.6 dB	12.2 dB (****)
11	MTV	13.6 dB	12.5 dB
15	CNN2	13.5 dB	12.9 dB (****)
19	C-SPAN	11.1 dB	13.1 dB (*****)
23	CINE/W	13.8 dB	12.8 dB

Transponder Bank 2 (5 watt) / boresighted CONUS only

4	SPOT/E	9.5 dB	9.3 dB
8	CBN	10.6 dB	9.3 dB (****)
12	SHOW/E	10.1 dB	9.6 dB
16	ACSN/HTN	11.2 dB	10.5 dB (****)
20	CINE/W	10.6 dB	10.3 dB
24	HBO/E	11.8 dB	11.0 dB

Transponder Bank 3 (5 watt) / boresighted CONUS, Hawaii

1	NICK	9.3 dB	8.3 dB
5	TMC	10.8 dB	10.4 dB
9	USA	11.3 dB	10.6 dB
13	HBO/W	11.3 dB	10.7 dB
17	CHN	11.5 dB	11.2 dB
21	TWC	no data	10.6 dB

Transponder Bank 4 (5 watt) / boresighted CONUS, Hawaii

2	PTL	11.0 dB	9.9 dB (****)
6	WTBS	11.1 dB	10.6 dB (***)
10	SHOW/W	12.1 dB	10.7 dB
14	CNN	11.1 dB	10.5 dB (****)
18	Reuters	11.4 dB	10.1 dB (******)
22	MSN	11.5 dB	10.6 dB

***—These services added **two or more** additional (audio/data) sub-carriers during the year period shown and some of the reduction in carrier level can be attributed to the additional sub-carriers using some of the full available 'power.'

****—These services added one additional sub-carrier during the test period and a slight decrease in carrier level might be attributed to the addition of that sub-carrier.

*****—C-SPAN was operating with less than full uplink power to F3R during the 1982 tests, and their increase in C/N reflects finally achieving 'saturation' of their transponder at its full rated output power.

******—Reuters 'backed off' their uplink power by 1.0 dB late in 1982 to allow the addition of the Equatorial Communications 'Spread Spectrum' slow speed Reuters service. Thus their actual power loss during the year would be 0.3 dB.

Now let's look at how the individual transponder banks did during the 13 month period:

Transponder Bank One (8.5 watts)

Average C/N 2/82	Average C/N 3/83	Loss/ 13 months
13.3 dB **(7*)**	12.6 dB	0.7 dB average

7* — Normalized for C-SPAN being fully saturated 2/82.

Transponder Bank Two (5 watt)

Average C/N 2/82	Average C/N 3/83	Loss/ 13 months
10.6 dB	10.0 dB	0.6 dB average

Transponder Bank Three (5 watt)

Average C/N 2/82	Average C/N 3/83	Loss/ 13 months
10.8 dB	10.3 dB	0.5 dB average

Transponder Bank Four (5 watt)

Average C/N 2/82	Average C/N 3/83	Loss/ 13 months
11.2 dB **(8*)**	10.4 dB	0.8 dB average

8* — Normalized for Reuters 1.0 dB back-off for Spread Spectrum

OOPS!/continues page 18

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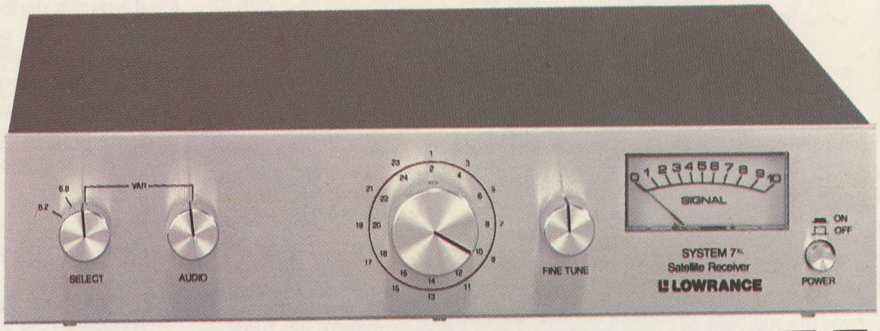

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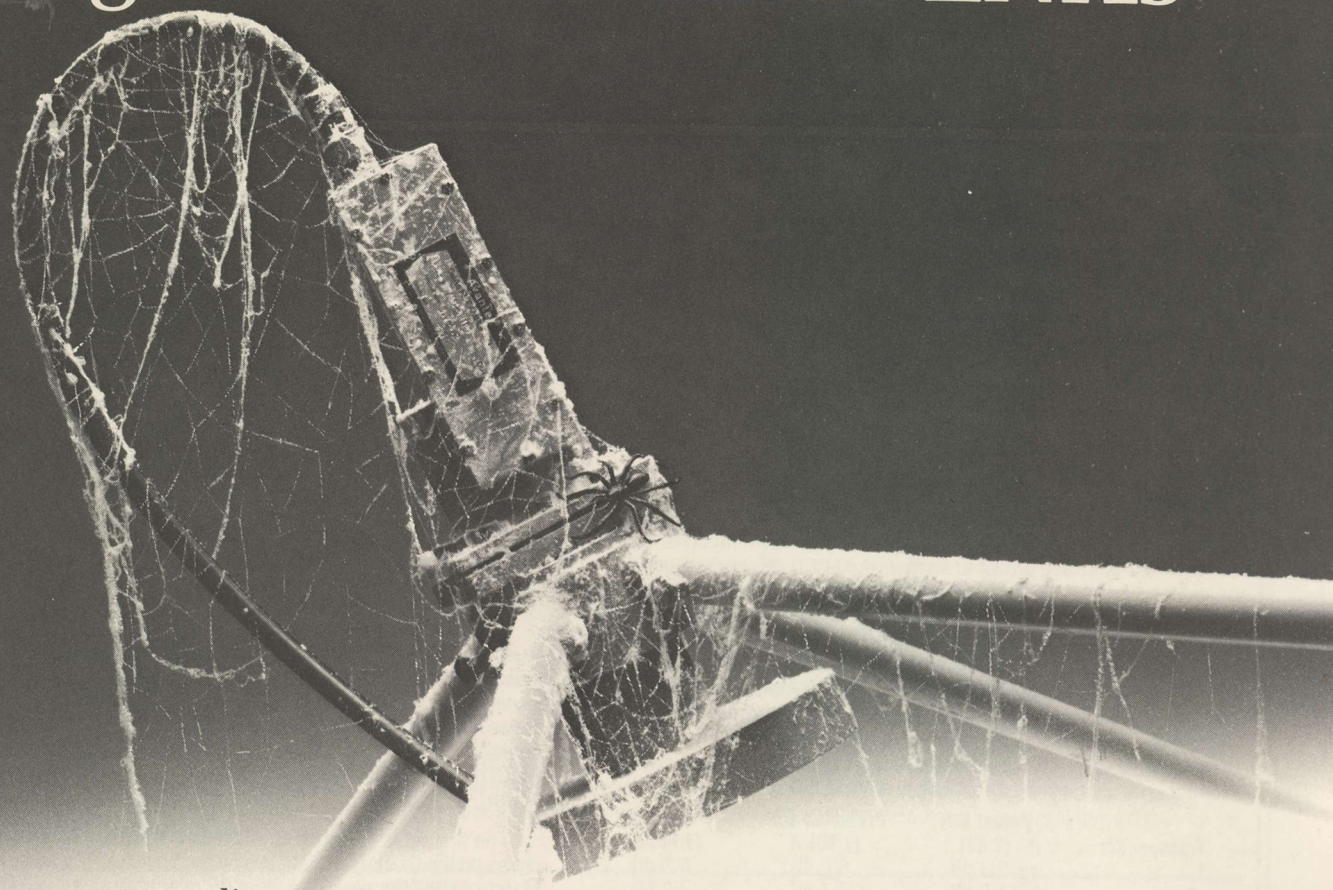

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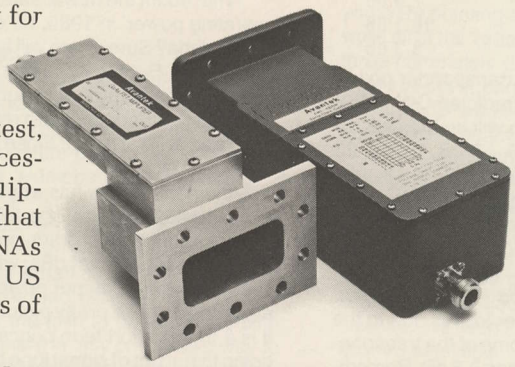

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No Single Component Tells the Entire Avantek Story

OOPS!/continued from page 15

Now, what do all of these numbers tell us?

First of all, there is an average loss spread over 24 transponders of 0.6 dB for the test (first) year of operation. One year ago, at the Gustafson location, there was an average power difference of 1.0 dB between the vertical and horizontal transponders; the verticals (largely because of the six 8.5 watt transponders) were stronger. Now, after one year, that power 'gap' is widening; 1.2 dB in favor of vertical.

Second of all, you would like to be able to look at these figures for the first full year and develop some form of prediction which will tell you when additional degradation will, for example, put six foot dishes in California out of business. As the power losses continue, the region where six foot dishes will deliver reasonably good pictures will shrink so that ultimately, long before the satellite is retired from service, no parts of the country will have totally adequate service from the satellite **even if** there is **no close spacing** of the satellites.

Data from Gustafson, RCA, and others indicates that there is a trend for the loss the first year to be the most serious. Gustafson's 0.6 dB 'average power loss' fits very closely to numbers predicted by RCA and others. In subsequent years there is an average loss expected of 0.4 dB per transponder, per year. That means that in March of 1984, the total loss will have grown to an average of 1.0 dB per transponder; or, in March of 1986 the loss will be 1.8 dB per transponder. With RCA expecting to obtain 7 years minimum service out of F3R, we are looking at a downward curve which will place all transponders down approximately 3.3 dB by January 1, 1990.

Just to drive the point home, let's look at what that might do to Gustafson's 10 foot antenna system in San Jose at the end of the design life of F3R. Keep in mind that a home system needs a C/N in the region of 10.0 dB for a 'first class picture,' while a picture with modest sparklies will be seen with a C/N of 8.0 dB.

Transponder	Actual C/N (2/82)	Predicted C/N (1/90)/A	Predicted (1/90)/B
1	9.3 dB	6.0 dB	5.6 dB
2	11.0 dB	7.7 dB	7.2 dB
3	**12.7 dB**	**9.4 dB**	**9.1 dB**
4	9.5 dB	6.2 dB	6.6 dB
5	10.8 dB	7.5 dB	7.7 dB
6	11.1 dB	7.8 dB	7.9 dB
7	**12.6 dB**	**9.3 dB**	**9.5 dB**
8	10.6 dB	7.3 dB	6.6 dB
9	11.3 dB	8.0 dB	7.9 dB
10	12.1 dB	8.8 dB	8.0 dB
11	**13.6 dB**	**10.3 dB**	**9.7 dB**
12	10.1 dB	7.8 dB	7.9 dB
13	11.3 dB	8.0 dB	8.0 dB
14	11.1 dB	7.8 dB	7.8 dB
15	**13.5 dB**	**10.2 dB**	**10.2 dB**
16	11.2 dB	7.9 dB	7.8 dB
17	11.5 dB	8.2 dB	8.5 dB
18	11.4 dB	8.1 dB	7.4 dB
19	no data	**10.4 dB**	**10.4 dB**
20	10.6 dB	7.3 dB	7.6 dB
21	no data	7.9 dB	7.9 dB
22	11.5 dB	8.2 dB	7.9 dB
23	**13.8 dB**	**10.5 dB**	**10.1 dB**
24	11.8 dB	8.5 dB	8.3 dB

What this tells us is that if predicted satellite transponder power degradations continue on course (found under 'Predicted C/N (1/90) A' column), Gustafson's present **ten foot system** will be below 8 dB C/N on all but transponders 3, 7, 9, **10,** 11, **13,** 15, 17, 18, 19, **22, 23** and **24** by January, 1990. That's a finely tuned 10 foot system. Oh yes. those that are **bold faced** are scheduled for scrambling over the next 24 months. That will leave this system with only 8 (out of an original 24) viewable transponders. And, only transponders 11, 15 and 19 will be above 10 dB C/N (high quality reception).

Furthest to the right is a second column labeled 'Predicted (1/90)/B.' This means that if you look closely at the power losses during the first year (ending March 1983), you will find that some of the transponders lost **more than 0.6 dB,** while some lost less than 0.6 dB. Remember, that 0.6 dB was an average of all 24 transponders. Those losing more than 0.6 dB, in particular, are worrisome since there is a message here concerning the long term ability of those transponders to deliver suitable output power levels to the earth below over the full 7 year life expectancy. A transponder that drops 1.0 dB the first year (PTL) or 1.4 dB (Showtime west) may well end up way down in the mud by January 1, 1990. So let's see how many in the far right column make the 8.0 dB C/N mark, based upon the higher (or lower) losses actually experienced during year one. Those predicted to be 8.0 dB C/N at the Gustafson terminal on January 1, 1990 now are 3, 7, **10,** 11, **13,** 15, 17, 19, **23** and **24.** Once again, those that are **bold face** are scheduled for scrambling. We had 13 transponders that made the 1/90 prediction the first time around, now we have but 10. And how many will be 10 dB C/N or better? Only 15, 19 and **23.**

Now let's put this into perspective for those who may be using or selling dishes smaller than 10 feet in size. We'll use 70% antenna efficiency (that's at the very top of the attainable curve) as a benchmark for antennas that are 10, 9, 8, 7 and 6 feet in diameter. To simplify the table shown here, we'll talk in terms of 'Antenna Banks' rather than individual transponders. You can develop your own table by simply using a receiver with an accurate signal level meter, and checking each transponder on each bank in succession; i.e. 3, 7, 11, 15, 19 and 23; 2, 6, 10, 14, 18 and 22; 1, 5, 9, 13, 17, and 21; and, 4, 8, 12, 16, 20 and 24. From the table trends shown here you'll create your own prediction list of when antennas of various diameters are apt to become useless in your region of the USA.

In the table here, we have to deal with the variations in signal level found across North America. Because antenna banks 3 and 4 share their 5 watt power with a sub-reflector spot beam to Hawaii, we have lower available power for CONUS (Continental United States). Because antenna bank 1 is 8.5 watts nominal power to begin with, it generally tests higher in ground signal level than say antenna bank 2 which has an almost identical antenna pattern, but is 3.5 watts lower in power.

The first table **(Central California Performance Comparisons)** draws on the Gustafson data. And it predicts that in March of 1985 and March of 1987 there will be further reductions in signal levels which will ultimately make even 8 foot antennas useless here (1987).

The second table gives you some insight into where you may be in the future, given the predicted continued degradation of the transponders. Start by finding your present **true condition.** 'Noise 1 Bank' means that to a critical eye, you can detect background noise on at least one **set** of transponders (those sets relate to the four sets of antenna banks, consisting of six transponders per bank). Start off with the top 'No Noise' line and proceed to the right through 10′, 9′, 8′, 7′ and 6′ antennas. Go as far to the right as you can truthfully say you can reduce antenna size and still find a 'no noise' (on any antenna bank) condition in your part of CONUS. Let's assume you can create a 'no noise' condition on a 7 foot antenna in 1983. Now go down the 7 foot column and you'll see that by 1984 you'll have noise in one (the weakest in your area) 'antenna bank,' while by 1986 you'll have noise in two of the antenna banks.

How accurate is this table? You may miss the years shown by a month or two, but beyond the variations of a few months, they are where we are all headed with small antennas (10 feet in diameter and down) in the years ahead.

What about the newer satellites; those that will be up there at 'peak operating power' in 1985, for example, because they are new at that point in time? Sure, there will be new C band satellites every year from now on out. But the ones that carry the home TVRO viewer interest, those with cable programming, are the F3R/W5/F4 set which, as we know, were all launched in a relatively short, and close-spaced span of time. And at least one of those (W5) may not make it for the seven year design life anyhow.

And none of this has **anything** to do with short spaced or closer spaced satellites; the one thing that most people seem most concerned about vis-a-vis smaller diameter dishes. This only relates to the wonderful world of dBs; where we count upon, and depend upon, certain minimum output power from each satellite transponder if we are going to make pretty pictures on earth. Transponder degradation? It is a bigger short term concern than short spacing, because we are going to run out of signal long before we run into multiple-serious short spaced problems.

EXAMPLE TABLE/ CENTRAL CALIFORNIA DEGRADATION EXPECTED

(Satellite F3R data only)

Antenna Size	Gain (70%)	1983 Averages				1985 Averages				1987 Averages			
		AB1	AB2	AB3	AB4	AB1	AB2	AB3	AB4	AB1	AB2	AB3	AB4
10′	41.7 dB	12.6	10.0	10.3	10.4	11.8	9.2	9.5	9.6	11.0	8.4	8.7	8.8
9	40.3 dB	11.2	8.6	8.9	9.0	10.4	**7.8**	8.1	8.8	9.6	**7.0**	**7.3**	8.0
8′	38.4 dB	9.3	**6.7**	**7.0**	**7.1**	8.5	**5.9**	**6.2**	**6.9**	**7.7**	**5.1**	**5.4**	**6.1**
7′	37.0 dB	**7.9**	**5.3**	**5.6**	**5.7**	**7.1**	**4.5**	**4.8**	**5.5**	**6.3**	**3.7**	**4.0**	**4.7**
6′	35.8 dB	**6.7**	**4.1**	**4.4**	**4.5**	**5.9**	**3.3**	**3.6**	**4.3**	**5.1**	**2.5**	**2.8**	**3.5**

Bold faced listings are those that have dropped, due to satellite degradation, and/or, antenna size reduction **below** 'magic' 8.0 dB noise threshold on best of present generation home TVRO receivers. For translation to your own locale, see **'Noise Degradation Versus Time'** table here.

NOISE DEGRADATION versus TIME TABLE

(Applicable F3R, F4, W4 and W5)

INSTRUCTIONS: Start at top line ('No Noise') and read to right to find smallest antenna which fits your present (today) 'no noise' situation. Discard vulnerable single transponders per antenna bank, such as on 6 bank 4 or 21 on bank 3. 'No noise' is defined as no noticeable sparklies on majority (four or more) of the six transponders on a single antenna bank. Now read 'down' that column to see when you can expect to see noise on one bank (four or more transponders in single bank), and left/right in same column under same no noise/noise (X) banks to see what effect will be on other antenna sizes in same year.

Antenna Size:	10′(*)	10′	9′	10′	9′	8′	10′	9′	8′	7′	10′	9′	8′	7′	6′
No Noise	1983		1983			1983				1983					1983
Noise/1 Bank	1985	1986	1985	1988	1986	1984	1989	1987	1985	1984	1990	1988	1987	1986	1984
Noise/2 Banks:	1987	1988	1987	1990	1988	1986		1990	1988	1986		1990	1989	1988	1986
Noise/3 Banks:	1989	1990	1989		1990	1988			1990	1988				1990	1988
Noise/4 Banks:															1990

***Remember**—Read across the 'no-noise' column to the right until you find the smallest antenna in your area that is **currently producing noise free signals** on all transponders (defined as 4 out of six on each of the four antenna banks). Stop at that size, for 1983, and read down to see how that smallest size will fare by 1990, and compare others in larger sizes for that same section of the table.

Now, what about close spacing? Let's tie all of this together in terms of satellite power, first of all. What do you suppose is going to happen if the satellites move closer together, and, the smaller antennas have a difficult time zeroing in one two **equal powered** satellites? 'Some interference' is the right answer. Now let's suppose that we have satellites 2 or 2.5 or even 3 degrees apart, but now we have a brand new one with 9 or 10 watts power sitting right next door to an older, tired satellite where the power has dropped off to say 5.5 watts. Now we have the short spacing being accentuated by a 2 to 2.5 dB power difference. Going the 'wrong way' (i.e. the stronger one interfering with the weaker one), your problem with a close spaced orbit belt just got bigger. And in the **real world,** we are going to have a constant ebb and flow of old satellites and new satellites in the sky. They will run their seven to eight year life-span, degrade in power, and then be tossed away for a new, higher power replacement. Meanwhile right next door, on one or both sides, are older satellites in various stages of 'power decay.' The problem, once it begins, will be with us from that point forward. Right away you can tell, before you even learn about the close spacing plans, that you are **not going to care** for this very much, right?

OUR DISH Will Work/Hype versus Fact

There is only one way to tell that a particular antenna, with a particular and specified f/D, equipped with a specific feed, will work with either 2, or 2.5, or 3 degree spacing. You take that package to an antenna test range and you have competent people using sophisticated equipment 'test' the antenna for 'sidelobe performance.'

What is that all about?

Any type of directional antenna, such as a parabolic dish, has a 'pattern'; a precise, measurable 'beamwidth' where the gain of that antenna is concentrated. You can make **small** changes in the shape of the beamwidth/pattern by modifying the feed, playing with the f/D, or even placing pieces of metal inside of the dish to break up the dish whole-surface concentric, shape. But, there is only one known way to make the pattern 'tighter' (i.e. less wide) **everytime;** make the antenna dish surface larger. There are some fairly basic laws of physics involved here.

As the **diagram** here shows, most antennas have a 'measured 3 dB beamwidth.' That means that the pattern of gain portion of the antenna beamwidth is of a specified width (measured in degrees). If your antenna is pointing exactly at the satellite, you will recover maximum power from the satellite (point 'A' on the beamwidth plot shown). If your antenna is pointed slightly away from the satellite, you have a reduced amount of signal intercepted by the beamwidth of the antenna. When your antenna is pointed off of the satellite, such that you are now receiving 3 dB less signal than you would be if you were pointed directly at the satellite, this is the 3 dB 'beamwidth' of the antenna. Numbers like 1.2 or 1.8 "degrees" are common for 3 dB beamwidths in our field. **The 3 dB beamwidth is not the beamwidth you care about.** Why?

Well, **if** it happened that an antenna had a 3 dB beamwidth of say 4 degrees (this is an example, not any specific product), and the satellites were spaced 2 degrees apart, then in our example when you were pointed exactly at satellite '1', the gain of the antenna would be 3 dB reduced (from maximum gain) 2 degrees either side of the satellite you were pointing at. That would mean that if satellites 'A,' 'B' and 'C' were all of the exact same strength, or power level, you would receive three completely different sets of signals at once. The desired one would be the strongest of all, but the two on the side ('B' and 'C') would be only 3 dB 'weaker,' falling as they would at the "3 dB down" point of our antenna beamwidth pattern.

The beamwidth we really care about is that beamwidth where the main portion of the TVRO/ARO antenna is down an absolute minimum of say 12 dB (remember the ITT tests recounted earlier?). 12 dB, it turns out, is where 50% of the people will find the interference 'objectionable.' Better yet, we would like to be 18 dB down the 'curve,' or off to the side of the peak or main gain, just to be sure that when the satellites are adjacent to others that are as strong as the desired satellite, we won't receive 'noticeable interference' from the non-desired satellites.

OOPS!/continues page 22

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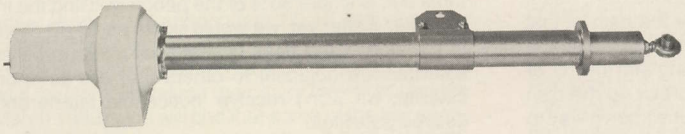

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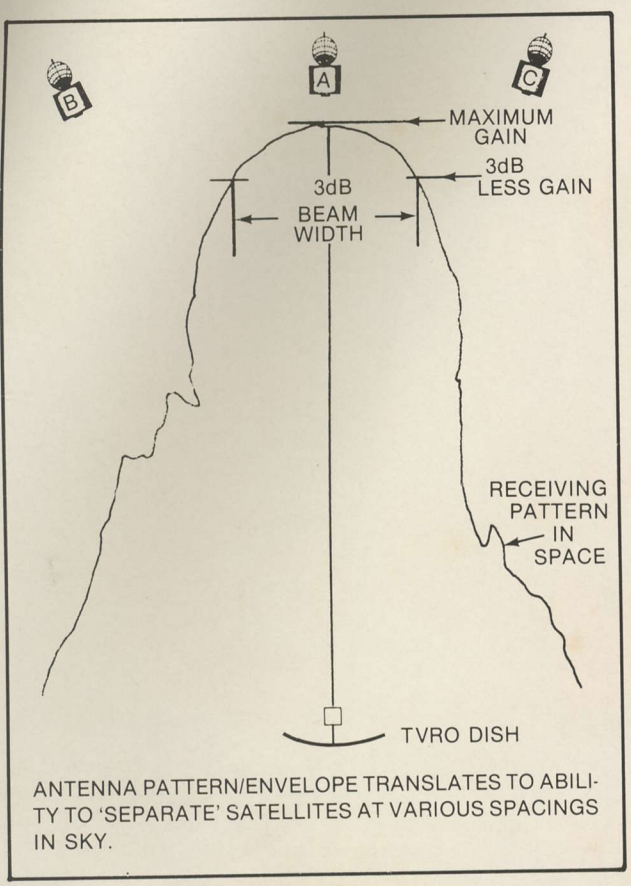


ANTENNA PATTERN/ENVELOPE TRANSLATES TO ABILITY TO 'SEPARATE' SATELLITES AT VARIOUS SPACINGS IN SKY.

Now, what about the antennas we have today?

As noted, the only way you can be certain of the 'beamwidth' of an antenna is to have that antenna, equipped with the exact design of feed, feed mount and f/D as will be 'sold,' checked on an antenna test range. On an antenna test range, the antenna is connected to a set of 'plotters'; machines that draw on graph paper the exact receiving pattern of the test antenna as the antenna is 'rotated' or turned towards and then away from a 'test signal source.' A receiver connected to the test antenna is in turn connected to the 'plotter' and the signal level received by the antenna is drawn on the plotting paper as the antenna points left of, at, and right of the test signal source. The signal source is a 'simulated satellite' in the field, and if you calibrate just how fast the antenna is moving 'towards' and 'through' and 'away from' the test signal source, you have a method of 'scaling' the resulting paper plot to represent 'degrees of beamwidth.'

This is not a complicated procedure. It may cost the antenna manufacturer several thousand dollars (the size of the antenna plays a part in the cost of the tests). If the test range is 'certified' (meaning the equipment and techniques have 'passed' a test for quality work), then the antennas checked on that range can be given 'certified performance statements.' The same test range will also, in the process, determine exactly how much 'gain' the antenna has. So the manufacturer knows, when he is done, exactly what his antenna will do; pattern, **and,** gain. He will be able to pass this information on to his customers as an assurance or 'guarantee' of performance. Virtually all of the big dollar, commercial grade antennas are so 'certified.' **Very few of the home style TVRO antennas are so certified.**

Yet many of the antenna data sheets do publish '3 dB' (or 'halfpower'; one of the same) beamwidths. Still others reference an FCC criteria for antenna pattern. How do they find out these numbers if the antennas have **not been tested,** in the exact form they are being sold?

One way to do this is to locate a copy of an Andrew or Prodelin or Scientific Atlanta (etc.) antenna data sheet for an antenna 'of the same size' as your TVRO antenna. Find the 'certified statement' for 3 dB/halfpower beamwidth on that data sheet, and, "copy it." Aren't all 8 foot antennas just about alike? We'll see.

Another way to do it is to find out what a 'good set of numbers' **should** be, and then add a line to your data sheet that uses that number. The guy making the antenna is proud of it; all of his numbers are 'good numbers,' so why shouldn't his beamwidth number be 'good' also?

Let's look at what some of the **certified** antennas claim for their 3 dB or halfpower beamwidths. These are representative of what you can expect with a brand name, big dollar antenna:

Antenna Size	3 dB Beamwidth
15′	1.2
14′	1.3
13′	1.4
12′	1.5
11′	1.65
10′	1.8
9′	2.0
8′	2.3
7′	2.65
6′	3.0

But, isn't half power beam width of only minor importance? Isn't the real problem with the amount of 'gain remaining' when you have moved 2 or 2.5 or 3 degrees off of the center of the beamwidth pattern? Right. Now, what happens here?

The FCC has done most of the engineering homework for you by specifying an 'antenna envelope' which the antenna must meet (or exceed) to be assured of not having problems with close spaced satellites. **Antenna envelope.** That's the pattern of the full antenna, set out so that you can determine with accuracy the gain of the antenna system at any point from 0 degrees (dead ahead) to say 9 degrees or so to either side.

In the language of the FCC specification, an antenna to function in the 2, 2.5 or 3 degree spacing world must have an antenna envelope that is equal to or better than **". . . 29 minus 25 log theta. . ."**

Now before you can determine whether an antenna meets or exceeds this criteria, you must (absolutely must; no other way) take the antenna in the exact form that it will be sold and shipped (same feed, same feed mounting system, etc.) and set it up on a test range. And then you measure the antenna envelope.

Long ago, before the FCC adopted the new "29 minus 25 log theta" guidelines, they had another guideline; one that they felt was adequate for **4 degree spaced** satellites. That envelope pattern was **". . . 32 minus 25 log theta."** As you can quickly see, it is almost the same pattern. Only the front number (29 versus 32) has changed. But that change is substantial because it relates to the way the envelope 'decays' (pulls in.) It is the 'pulling in' on the envelope (narrowing of the **sidelobe pattern**) which gives the antenna the ability to function with closer spaced satellites.

Sidelobe?

An antenna pattern is like a balloon filled with water. The amount of water in the balloon is fixed. If you squeeze in on the balloon with your hands, the shape of the balloon changes. Laying by itself, on the table, it is mostly a circular glob. In your hands, you can shape it in many configurations. Squeeze in at the **middle,** it grows and expands at the **back** and **front.** Squeeze the back, and it reshapes at the front.

A sidelobe is gain 'squirting out' of the primary front pattern in any direction other than 'straight ahead.' If you could build a **perfect** antenna and feed, **there would be no sidelobes.** All of the gain the antenna was capable of would be 'straight ahead.' There is no such perfect antenna. **There are always sidelobes.** And the sidelobes are your problem with close spaced satellites.

There is a popular belief that sidelobes can be 'told' where to appear, and where not to appear. That they can be 'steered.' There is a small amount of truth in that. **If** you could tell a sidelobe where to appear, and where not to appear, then you would tell them **not to appear** at 2, 2.5 or 3 degrees. Those are the points, away from the main or major antenna gain lobe (i.e. 'straight ahead') where there are or will be new satellites. We don't want a sidelobe to 'pop up' or 'squirt out' dead on a satellite 2.5 degrees off of the main heading of the

antenna.

Unfortunately, you can tell a sidelobe not to appear at say 2.5 degrees, but in doing that clever bit of engineering, you are almost guaranteed that there is likely to be a sidelobe at 2 and 3 degrees in the process. In other words, you might be able to eliminate or steer **some** of the sidelobes, but when you eliminate or move one, you simply enhance or enlarge another. Remember the balloon filled with water? Squeeze in a little 'here,' and you see another point pop out 'there'!

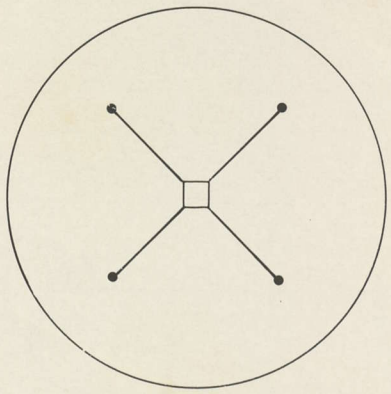
There is also a popular theory that people who have designed antennas in the 'even string' (10′, 8′, and 6′ diameter) are in better 'shape' than those who have designed in the odd 'string' (i.e. 11′, 9′, and 7′). The basis for this story is that the designers have accepted certain 'general sidelobe patterns' or 'repeat patterns' by selecting the diameter of the dish. There **are** certain **similarities** between all antennas of a 10 foot diameter, when we are comparing antennas that have the same general region of f/D. Likewise, if we are dealing with the same general f/D region, all 7 foot antennas have **similar looking** main lobe and sidelobe patterns. But there ar other factors at work here; factors which go beyond selecting a certain antenna diameter and a specified f/D.

There is, for example, the effect on the sidelobes from the **antenna feed support structure,** and, the feed itself. Professional antenna designers look very carefully at the way they will hang the feed out in front of the dish. They know that the feed represents an obstruction to the dish surface, and energy that comes to the dish directly through the feed/obstruction is reflected away in a myriad of directions. Some of this energy reflects first from one feed support, and then from another, bouncing around the dish surface like a crazed golf ball. All of this bouncing and rebouncing has a direct relationship on the sidelobe pattern performance of the antenna. Generally speaking, the effect of a feed obstruction (the feed itself, or, the feed support pieces) is greatest for signals that are **perpendicular to** the feed support or feed. Professional antenna designers have discovered that the minimum ill-effects to the sidelobe pattern(s) is created by enclosing the feed in a smooth, thin cylinder. Feeds that have big chunks of irregularly shaped metal out there (i.e. a rotor, a bunch of steel or aluminum plates welded into some type of housing, or platform for the feed system) cause the most problems. Yes, a nice streamlined, as thin as possible feed structure, with rounded sides and a thin profile (just barely larger than the feed itself) is of measurable value when you are fighting the sidelobe game.

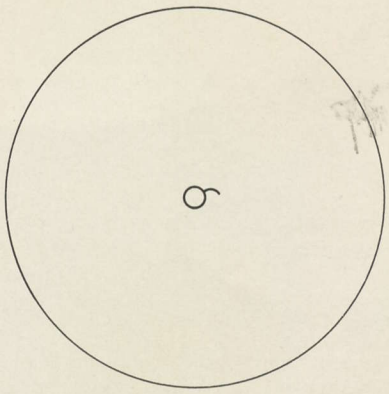
When antennas are placed on a test range, the test range looks at the gain and sidelobe performance of the antenna in two 'planes.' One plane is called the **E plane,** and that is technical talk for **horizontal** signals. The other plane is the **H plane,** and inspite of the letter H, that is technical talk for the **vertical** signals. Remember that feeds and feed support pieces represent an obstruction to the dish surface, and these obstructions cause the **greatest bad impact** on the antenna's sidelobe patterns **when the obstruction(s) are perpendicular to the signal itself.** Thus if you have a set of struts supporting the feed which are so arranged around the dish that two or more are say perpendicular to horizontally polarized signals coming to the dish, you have the worst possible situation for the horizontal signals. If the antenna employs a tripod (three legged) feed support, and by chance two of those three legs are more perpendicular to horizontal signals than they are to vertical signals, it will be the horizontal side that will suffer.

An antenna on a test range can 'see' these obstructions, and plot the patterns created by the obstructions. And things such as this can make two antennas with identical diameter/aperture, feed type (i.e. Scalar horn) and f/D **not turn out equal** on the test range. Just moving the tie-down position of the feed supports can shift the sidelobes of the antenna (up **or** down), and move them into and out of the dangerous 2, 2.5 or 3 degree off-boresight headings.

Many of the present generation TVRO antennas were designed by copying other antennas. The copier was very careful to exactly duplicate the depth of the dish, the feed and so on. Then in a wild, 'creative moment' he decided to use a 'quadpod' (four legged) feed support rather than a 'tripod.' Or, he simply decided he liked the 'looks' of the antenna better with the tripod legs 'shifted' 20 degrees around. **Little did he know what he was doing to the sidelobes!.**



"QUAD-POD" FEED MOUNT HAS STRUCTURAL STRENGTH, AND SIDELOBE PROBLEMS.



"BUTTON HOOK/FIGURE 7" MOUNT HAS STRUCTURAL WEAKNESS (FEED OSCILLATES IN WIND) AND MAY ALSO HAVE SIDELOBE PROBLEMS.

There are other rules of antenna design which enter into the problem. Generally speaking, antenna designers decide on a diameter or aperture size. Say ten feet. OK, now they have to work to get maximum gain. That is, afterall,the name of the game. Or is it?

Maximum gain, **and,** minimum sidelobes, generally do **not** go together. You can select a dish f/D where the gain is high (.4 to .6 f/D) or you can select a dish design where the sidelobe control is best (.25 to .4). Control over the sidelobes, that is, minimizing the sidelobes all the way down the "32 minus 25 log theta" or "29 minus 25 log theta" envelope curve, is a game of selecting both an f/D **and** a feed design. Since we will always have sidelobes, what we want to do is to be sure that none of the sidelobes we do have extend outside of the magic curve created by the 'log-theta' envelope. At some points along that curve even an antenna that meets the curve criteria will have sidelobes that nudge right up to the curve borderline. Just a few tenths of a degree away, the same antenna could have sidelobes that are ten or fifteen dB below the curve.

The rules say that you will get maximum gain from the dish when you allow the feed to taper its own 'envelope' or 'view' of the dish surface so that the very outer edges of the dish are seen "10 dB weaker" than the center of the dish in front of the feed. That's the trick with feeds; to contour or shape their 'vision' so that they see different

OOPS!/continues page 25

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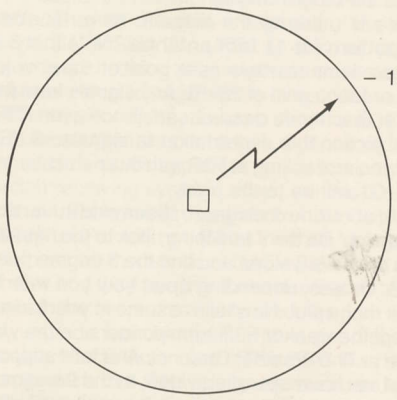
OOPS!/continued from page 23

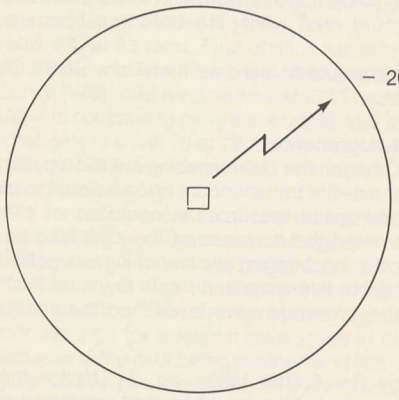
points along the dish surface, away from the center or dead ahead point, with varying amounts of 'efficiency.' You get excellent gain from the overall dish when the very outer edge is 'seen' by the feed at a level that is 10 dB lower than the center of the dish.

Unfortunately, you cannot properly control the sidelobes as well as you might when the feed looks at the edges of the dish '10 dB down.' Experience shows that you must change the way the feed looks at the edges of the dish (and all points inward towards the center 'hot spot') so that for maximum control of sidelobes, the edge of the dish is now '20 dB down.'

20 dB down? 10 dB down?



MAXIMUM GAIN? FEED "SEES" EDGES OF DISH '10dB DOWN' REFERENCE DISH CENTER.



MINIMUM SIDELOBES? FEED "SEES" EDGES OF DISH '20dB DOWN' REFERENCE DISH CENTER.

Now let's jump back to that predictable and totally unpleasant world of degrading satellites. Remember that on the average transponder, we saw 0.6 dB of the available or effective power 'go away' between March of 1982 and March of 1983. Also remember that we can project additional losses of 0.4 dB per transponder per year over the period through 1990.

With transponder power going down (by nearly 0.05 dB **per month**), is this a time to allow ourselves to purposefully set out to design and install antennas that have anything **less than** maximum gain? Obviously the answer is we will need all of the gain we can get, by 1990, if we want these small dishes to continue to perform.

On the other hand, we have the sidelobe problem. Today we have our first three degree spaced satellite in the sky (Hughes Galaxy 1 at 134 degrees, some 3 degrees away from RCA F3R at 131 west*). Very few antennas, even with the most detrimental design of feeds and feed support members, are likely to have serious problems separating F3R and 'G1' in the sky. Well, very few in the 9 and 10 foot class. There may well be some early casualties in the smaller antennas as this is written and read. It will be another six months or more before G1 is 'loaded' with 12 or more fulltime transponders, so some of the ill effects on even the improperly designed smaller dishes may not be apparent until early in 1984 or so. You will start to notice the problem first on those lower powered transponders on F3R (remember that not all of the antenna 'banks' are created equal, no matter where you are!) as they sit there 3 degrees in space away from the 9 watt G1 signals. Remember, a 5 watt signal that has lost .6 dB or more in its first year is now a 4.5 watt or less signal. And, a 4.5 watt signal is exactly 3 dB weaker than a (brand new) 9 watt signal. Right away there is a 3 dB power advantage for the new G1 signal if it is on the **same** transponder frequency as the older F3R signal.

Reference is made to the diagram here, labeled **'beamwidth/horizontal pattern for 11 foot antenna.'** Note that 3 degrees to the right from the maximum power peak point on the envelope, we have a reduction in antenna gain of 26 dB. Any signals from that point will be 26 dB weaker than those dead-ahead. Since even ITT found virtually no viewer objectionable degradation to signals 18 dB apart, we are safe here. If you are looking at F3R with this particular 11 foot antenna, by the way, G1 will be to the right.

Now look at our next diagram; **'beamwidth/vertical pattern for 11 foot antenna.'** Do the same thing; look to the right of the maximum power peak on the envelope and find the 3 degree point. Now we are down 17 dB. Or less, depending upon how you wish to interpret the antenna test range plot. Now let's assume in your location you wish to tune in one of the weaker F3R transponders on the vertical side; say Nickelodeon or The Weather Channel. And let's suppose that on TR1 and 21 of G1 we have operating video, at the 9 watt power level. The envelope pattern tells us we have no more than 17 dB rejection from the 3 degree spaced G1 signal. But, with the G1 transponders at 9 watts and the F3R transponders already degraded to 4.5 watts or so, now we have a 3 dB power difference. Given the worst situation, that 17 dB of 'isolation' between the two provided by this antenna is now 14 dB of isolation. And that's right now, in 1983, before we get to 2.5 or 2 degree spacing, and while the F3R transponders are relatively healthy.

Yes Virginia, just as sure as there is a Santa Claus, there **are** problems ahead.

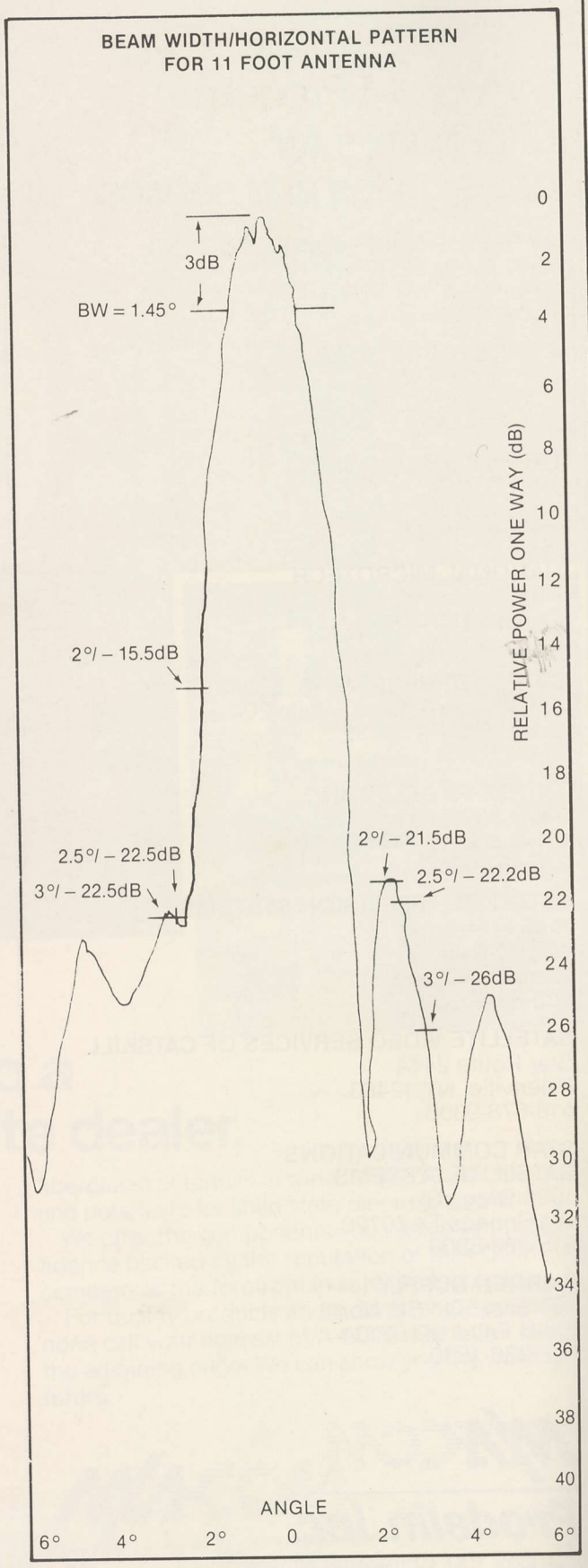
THE FCC Assignments

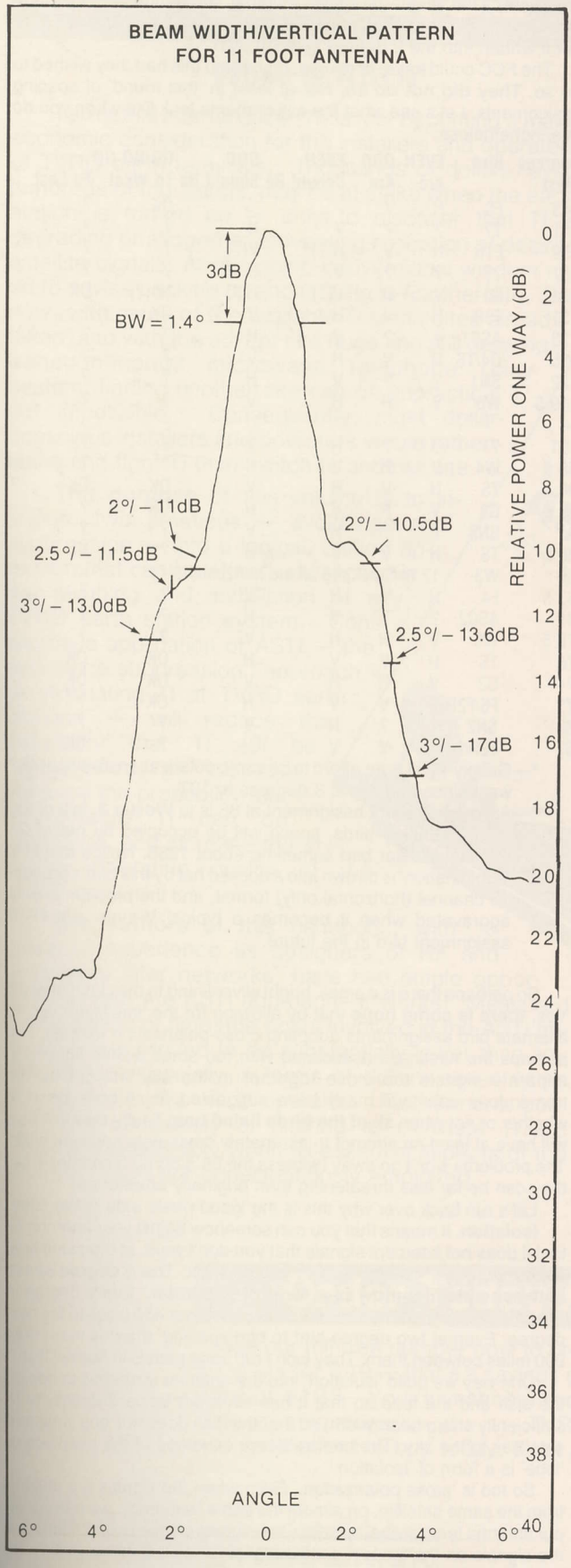
The FCC began the close spacing decision by noting that future demands for satellite transponders are predicted to exceed all of the present orbital space resources in operaton, or planned. An FCC spokesman noted that because of the long lead times involved in planning, designing, building and launching new satellites, steps must be taken "four to five years out front" to insure that when the total capacity of the (present) system is reached, there will be new capacity available.

1) **Study the 4 GHz table; pg. 11.** Notice that between the western end of the orbit belt (143 west) and eastward to 137 degrees, the birds are spaced at 2 degree intervals.

---

* — Some confusion whether Galaxy 1, **due for launch at** CSD **presstime,** would be spaced at 3 degrees (134) or 4 degrees (135) initially. If it ends up at 135 for now, FCC says they plan to have it re-spaced at 3 degrees (134) **'before end of 1983'.** Problem is with multitude of multiple feed antennas already sold and installed **by cable firms,** to allow dual-pick-off of F3R and G1. If feeds can be field adjusted or modified for 3 degree spacing, without big hassles, 134 will be it. If not, FCC will allow G1 to sit at 135 until antenna makers can retrofit the feeds now out the door. Assumption in text, **here,** was that G1 **would be spaced at 134 west** from turn-on. If not, facts don't change; only 'timing'.





2) Now flip to the opposite end of the table, and you will see that starting at 67 west and going west, the birds are also at 2 degree intervals; up to 76 west (with a 3 degree one-time-only gap 69 to 72 west).
3) Continue west from 72 and you see that the birds are now spaced at 2.5 degree intervals until we reach all the way to 101 west. That's a total of ten birds in a row at 2.5 degree spacing.
4) Now jump across the Canadian and Mexican mid-arc safety ground and start again at 119.5 west; the first space, between W5 at 119.5 and Spacenet 1 at 122 is, again, 2.5 degrees. But, starting at 122 and through 137, all of the 4 GHz birds are 3 degree spaced. That's a total of six birds, spaced at 3 degree intervals within the 122/137 region, although closer spaced (2.5 on east end, 2 on west end) 'coming' and going.

There would appear to be a number of purposeful patterns here. Let's ponder why these exist.

The market pattern evolving **before** the FCC got into the act had virtually all of the cable television programming shoved into the W5/D4/F3R/G1 realm. They all sit within a segment of the arc, and that means that those CATV/SMATV, LPTV et al small dish receiving systems are by in large 'looking at' a relatively small segment of the sky. A cable system with a ten foot dish is in no better shape than a homeowner with a ten foot dish, of course. And the FCC recognizes this fact. So the master plan was to reduce, but not 'all the way,' the spacings for those birds which appear to be predominantly in use for small (commercial) receiving systems. Now, will this 3 degree 'extra wide spacing' hold for this six-bird-segment of the belt?

The FCC says 'no,' it will not. What they are doing, for now, is recognizing that there are thousands of CATV/SMATV et al small dish terminals out there. And they see that there does need to be a period of time during which the users are able to amortize their investments, and if required, upgrade their terminals with larger dishes.

The FCC's Joe Harcaruka noted **"The FCC has adopted an evolutionary approach to 4 GHz assignments so as to not make obsolete the satellites, and those tens of thousands of terminals that use them."**

This suggests that by the mid 1990's at the latest, we will be looking at 'uniform 2 degree spacing' for all 4 GHz satellites. At least that is the Commission plan right now. It is going to be during those intervening years that there is confusion in the marketplace. And not all of the players are being treated equally. Take RCA's less-than-popular cable bird, F4, at 83 west. First of all, it will eventually move slightly west; to 83.5 west. Then it will find itself sandwiched in between a Westar bird (W6) at 86 west and an AMSAT bird at 81 west. It will be difficult for it to continue to carry low-budget, low-appeal CATV programming channels to small 10 or 12 foot dishes when it is caught between two **newer** full power birds (W6 will launch early 1984; AMSAT will launch early 1986).

It is in part the confusing scenario of who will launch, what, when that really makes following the transition ahead a game for computers. Each of those yet to launch have their target dates. To make those target dates, they must get their funding in order to get a satellite builder cracking, stay on top of the satellite builder to get the bird built and checked out, arrange for a launch date years in advance (because launch schedules are now being planned and launch spots are now being sold up for five years in the future), and then finally figure out how they are going to market their bird's transponder space.

A bird that carries only narrow band communications will cause less problem for a close spaced bird carrying only video, for example, than will two close spaced birds both carrying video. Each would-be (future) satellite operator has his own announced game plan; he **'says'** he will sell narrow band space, or he **says** he will sell video only, or, he **says** he will sell combinations of the two. Even if he sticks to that announced plan, the full extent of the interference potential to smaller dishes will not be evident until he actually launches and gets people onto the transponders; the final assignment of individual transponders to specific types of users will seldom be made far in advance. Until those assignments are made, and assessed, the extent of the 'damage' to 12, or 11, or 10, or 9 (etc.) foot dishes will **not be apparent.**

Ultimately, with two degree spacing between **all** birds, we'll all know just what will work, and, what will not work. But, for the next 12

years or so, until we reach that 'even-2-degree spacing' plateau of say 1995, there will be different situations for different bird to bird spacings, related to bird **power** level, bird **age,** transponder **use,** and transponder to transponder **polarization** on adjacent birds.

One of the 'early suggestions' to the FCC was that they alternate bird assignments so that the vertical and horizontal polarizations, on adjacent birds, will be 'crossed' from one another. For example, place a Western Union Westar format bird (even channels vertical, odd channels horizontal) adjacent to an RCA/COMSTAR format bird (even channels horizontal, odd channels vertical). **Now what would that do?**

Well, we all know that at the present time on all of the modern 24 channel birds we have 12 sets of channels that are vertical, and 12 more that are horizontal. And that for all practical purposes the vertical and horizontal channels 'share' the same general 'spectrum space.' This works, without unacceptable interference, because it is possible for you, on the ground, to rotate your antenna feed system to alternately be 'vertical' and 'horizontal.' When your feed system 'probe' is vertical, in 'phase' with the incoming vertical signals, your terminal receives only the vertical transponders. And vice versa; horizontal.

This is called **'cross polarization isolation,'** or simply 'cross pole' for short. Obviously if you can separate two signals that share almost the same transponder space by flipping your feed from vertical to horizontal, you would have no real difficulty separating two different satellites spaced even 2 degrees apart when the vertical channels on one satellite corresponded to the horizontal channels on the adjacent satellite(s). That seemed like such a simple, straightforward approach to making better use of the spectrum, that many pushed at the FCC to get it written into the 2 degree spacing plan.

The FCC could have, of course, mandated this had they wished to do so. **They did not do so.** Not at least in 'this round' of spacing assignments. Let's see what the assignments look like when you do this, nonetheless:

Degrees West	Bird	EVEN Are	ODD Are	EVEN Should Be	ODD Should Be	GO/NO GO To West	To East
143	F5	H	V			OK	?
141	??	?	?	V	H	?	?
139	F1R	H	V	H(?)	V(?)	?	?
137	??	?	?	V	H	?	?
134	G1	V	H	V(*)	H(*)	No(?)	OK
131	F3R	H	V	H	V	OK	?
128	ASC1	?	?	V	H	?	?
125	D4/TS	H	V	H	V	?	?
122	SN1	?	?	V	H	?	?
119.5	W5	V	H	H	V	?	?
—							
101	?	?	?	H	V	?	?
98.5	W4	V	H	V	H	?	?
96	TS	H	V	H	V	OK	OK
93.5	G3	V	H	V	H	OK	?
91	SN3	?	?	H	V	?	?
88.5	TS	H	V	V	H	?	No
86	W3	12 channel bird/all are horizontal (**)					
83.5	F4	H	V	H	V	?	?
81	ASC2	?	?	V	H	?	?
78.5	W6	V	H	H	V	?	?
76	TS	H	V	V	H	OK	OK
74	G3	V	H	H	V	OK	OK
72	F6/F2R	H	V	V	H	OK	?
69	SN2	?	?	H	V	?	?
67	F2R/F6	H	V	V	H	?	OK

*—Galaxy 1 (G1) can afford to be same polarization as bird at 137 west since spacing is 3 degrees to 137.

**—Although present assignment at 86 is to Westar 3, last of the US 12 channel birds, space will be occupied by newer 24 channel Westar bird sometime about 1986. Notice that H/V 'coordination' is thrown into a cocked hat by this bird's present 12 channel (horizontal only) format, and the problem is only aggravated when it becomes a typical V-even and H-off assignment bird in the future.

MUSICAL SATELLITES

Many of the existing satellites are scheduled to be moved around abit, a direct result of the FCC's new 2/2.5/3 degree spacing plan. The effective date of these moves is still up in the air since the FCC is now receiving comments on when certain parts of the sky should adopt the new locational plan. There will not be one 'grand moving day' during which everyone will move. Rather, as new satellites are launched those that are nearby, in old positions, will be asked to move slightly to make room for the new entrants. Complicating this process, slightly, are the older generation satellites (W3, ANIK 2/3, Comstar D1/2, D3 and D4) which will, eventually, be replaced by new satellites. Finally, there is the matter of present orbit occupants such as F2 (now shared with F1) at 119 west; they will be allowed to continue to occupy space in the sky until new satellite launches require them to move, or, be taken completely out of service. Here is a look at what all of this moving around means.

Orbit Spot		Satellites		Notes
Present	Ultimately	Present	Ultimately	
143W	143W	F5	F5	
139W	139W	F1R	F1R	
134W	134W	G1	G1	
131W	131W	F3R	F3R	
127W	**128W**	D4	ASC1	ACS1 scheduled November '85
125W	125W	none	TS4	D4 will move here until TS4 is launched
123W	**122W**	W5	SN1	SN1 scheduled May 1984
119W	**119.5**	F1/F2	W5	Probable move May 1984
—				
114W	**111.5**	A2/A3	New Anik	Anik D2 scheduled late '85
109W	**108**	A/B	New Anik	
104W	**104.5**	A/D	A/D	
—				
99W	**98.5**	W4	W4	Probable move early '84
95W	**96W**	D1/D2	TS2	Probable early '84
none	93.5	none	G3	Sometime middle '84
91W	91W	W3	SN3	Probable move to 86W March '85
none	88.5	none	D3/TS3	Probable move from 87W March '85
87W	**86W**	D3	W3	Probable move from 91W March '85
83W	**83.5**	F4	F4	Probable move March '85
none	81W	none	ASC2	ASC2 scheduled April '86
79W	**78.5**	W2	W6	W6 scheduled April '84

So perhaps there is a small, bright silver lining to the cloud after all! Yes, **there is some hope** that by allowing for the 'intelligent use' of alternate bird assignments adopting cross-polarization formats, that perhaps the nastiness associated with too small dishes fighting to separate signals too close together in the sky will not be the tremendous upheaval many have suggested. It all boils down to whether or not when **all of the birds listed here** finally take flight we will have at least an attempt to alternately cross-pole adjacent birds. The problems won't go away (witness the 88.5/86/83.5 anamoly), but they can be far less threatening than originally envisioned.

Let's run back over why this is the 'good news' side of the story.

Isolation. It means that you can somehow adjust your antenna so that it does not intercept signals that you don't want, at the same time you are intercepting signals that you do want. **The 4 degree space between satellites now is a form of 'isolation.'** Every degree in space, over the equator, for most of us is just over 450 miles to the next degree. Even at two degree bird to bird spacing, there is more than 900 miles between them. They won't rub solar panels in normal flight.

One way we build 'isolation' into the antenna system is to design the dish and the feed so that it has sufficient forward directivity (a sufficiently sharp beamwidth) so that the dish does not 'see' adjacent satellites in the sky. The beamwidth or envelope of the main power 'lobe' is a form of 'isolation.'

So too is 'cross polarization.' Even when the signals are coming from the same satellite, on almost the same frequency, we can adjust our antenna feed 'probe' to isolate the signals on one polarization from the signals on the 'opposite' polarization.

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What Is ASTI?

Terrestrial interference (TI) is fast becoming a major economic consideration for the installers and operators of TVRO earth terminals. Thousands of dollars, even hundreds of thousands, may be at stake when the earth station is turned on — only to discover that TI is degrading or altogether preventing reception of desired satellite signals. At this point, conventional wisdom used to advise packing up and moving to another site. But now, with many of the available TI-clean sites already taken, and with the advent of a huge and still growing transcontinental microwave telephone relay system, finding another site can be impractical if not impossible. Consequently, most dollar-conscious installers and operators would rather stand and fight TI than switch to another site.

The purpose of this volume is to integrate two practices — avoidance and suppression — into a logical, unified approach that can be effectively applied in the planning and installation of any TVRO earth station system. Conscientious application of ASTI — the avoidance/suppression approach to eliminating TI at TVRO earth stations — will reduce the possibility that TI will be discovered at turn-on, enhance the probability that unavoidable TI can be eliminated, and increase the effective operating quality of the TVRO system.

The authors of this handbook, with years of experience as designers of RF and microwave filter networks, have had ample opportunity to test the ASTI approach—it works! Measured over a period of time, the costs involved in the ASTI approach have proved to be substantially lower than any alternative, especially in terms of dollars saved when the initial site was made operable. Furthermore, both cost and complexity of filtering to eliminate TI are lowered considerably when all essential aspects of the ASTI approach are conscientiously employed.

Contents Include:

The TI Avoidance/Suppression Approach; Why Satellites; How Your Earth Terminal Works; TI Sources; TI Symptoms; Selecting the Antenna for Least TI; TI Susceptibility of Other TVRO Components; How to Select a Site; The Pre-Installation Site Suvey; Defensive Installation; Use of Artificial Shielding; Filtering the TVRO; Filtering Special TVRO Systems; SMATV Techniques; Standard TVRO and Satellite Data; Formulas and Derivations...

About the Authors:

Glyn Bostick is the founder, president and chief engineer of Microwave Filter Company, Inc. He has been designing filters for the suppression of interference in cable TV systems, industrial and defense communications equipment, and satellite earth stations since 1967. Mr. Bostick has written a plethora of technical articles for trade publications, holds several patents and is a senior member of the IEEE.

John Fannetti is MFC's senior technical consultant and head of the company's new Field Service Division. He has 30 years of engineering and earth station troubleshooting experience, including 7 years as president of JDF Communications, a CATV consulting and TVRO installation firm.

William Johnson, chief engineer of research and development, is MFC's "voice" and travels around the country, upon request, to deliver ASTI-type lectures at various industry gatherings. In his technical capacity at MFC, Mr. Johnson is the design engineer in charge of special developmental projects. He earned his BSEE at Syracuse University and is currently engaged in graduate studies there.

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V-ODD H-EVEN	V-EVEN H-ODD	V-ODD H-EVEN	V-EVEN H-ODD	V-ODD H-EVEN	V-EVEN H-ODD

APPARENT CROSS-POLE/AJACENT BIRD SCENARIO

W5/119.5	SN1/122	D4/125	ASC1/128	F3R/131	G1/134
					
V-EVEN H-ODD	V-? H-?	V-ODD H-EVEN	V-? H-?	V-ODD H-EVEN	V-EVEN H-ODD

In effect, when we have transponders on the same bird operating on vertical polarization, and horizontal polarization, we really have the equivalent of two completely different satellites sitting in the exact same spot in space.

Now, since cross pole isolation gets us someplace in excess of 20 dB of isolation in even the most mundane of feed system (25 plus is more typical), and we know from past FCC filings made by ITT and others that 18 dB of 'isolation' is the point where even the most perceptive people just start to see 'interference,' how much can we really expect **when we have the good fortune** to be combining (1) 2 degree or more spacing, **and,** (2) cross-pole 'swapping' between alternated assigned birds in the sky?

From our antenna plots we see that even in less than ideal situations, the example **11 foot antenna** offered 11 dB of 'isolation' or beamwidth envelope rejection of a signal 2 degrees off of 'boresight.' **Add to that** the 20 dB we get with a ho-hum feed, and we are now above 30 dB. At 3 degree spacing, the same 11 foot antenna worst-case sidelobe was down, or 'isolated,' from the main pattern by 13 dB. **Add to that** the same 20 dB cross polarization isolations; 33 dB isolation.

CAVEATS

Since we started out this report with alot of negative data, it is best to end the report with a **fair appraisal** of the situation developing.

Fact one: We are presently in a period when we have a bunch of brand new, more powerful than before, satellites. Their 8.5 and 9 watt transponders are a 3 to 5 dB step upward from the 'old days' back in 1980/81. However, we already know that we will see those new transponders degrade or deteriorate by a total of approximately 1.0 dB the first two years and an average of 0.4 dB each year thereafter.

Fact two: Satellite power loss, over the lifetime of the satellites, is more than sufficient to wipe out the effectiveness of any 6 or 7 foot dishes on virtually all of the 5 watt power (when new) transponders. Only the higher power (8.5 or 9 watt) transponders will end up at end-of-satellite-life looking good enough that customers will not be ready to hang the dealer from the feed horn. This 'effect' will vary as satellite EIRP (footprints) varies across the country.

Fact three: We are **counting on** a rationale, sane selection by either the FCC **or** by the satellite operators themselves, of 'polarization formats' for the full orbit belt. We know what **some** of the formats will be because the birds are already in place, or, they are assigned to satellites that have an established 'pattern' to their satellite polarization schemes. **However,** there are ten satellites with questionable polarization schemes still to be 'counted,' at 4 GHz, and a less than persistent FCC or an irrational satellite operator could destroy the 'potential isolation' available by simply selecting the wrong polarization scheme. With a few problem areas (88.5/86/83.5) aside, there is at least the potential, **and hope,** here that we **may not be** in as bad trouble with smaller dishes as we had originally thought.

WHO'S Responsible?

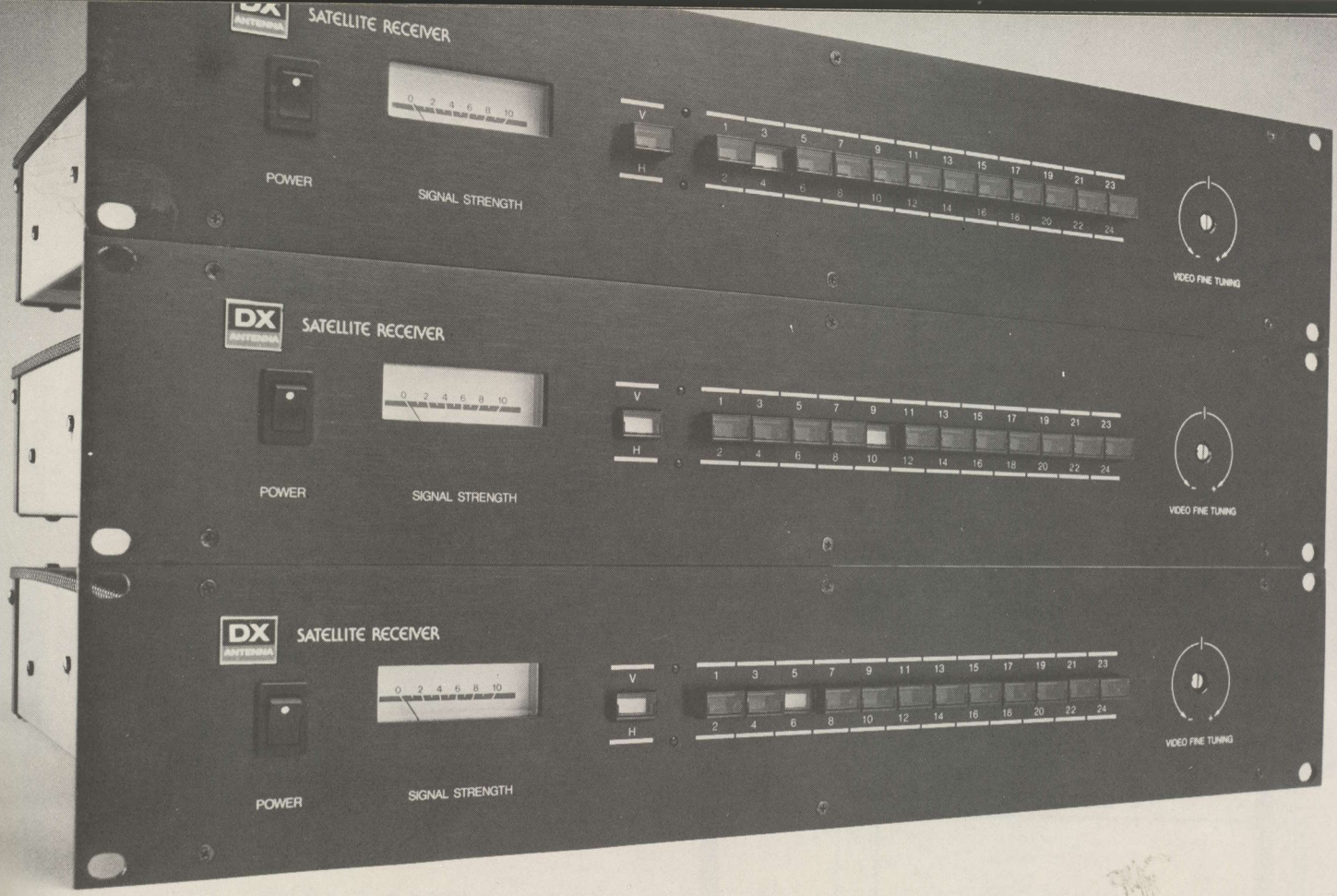
You, the OEM, understands the potential problems. You, the distributor, understands the potential problems. And you, the dealer, also understands the potential problems. Now, **who** is going to be responsible **to the consumer** if a system is sold, installed and made operational in 1983; and it falls apart, because of satellite degradation, or, satellite close spacings, in say 1985 or 1986?

There is ample case law concerning this. A seller of a product who **knows of a product deficiency** but who fails to tell the potential customer about that deficiency **can be held legally liable** by the customer, in many states. Consumer protection laws are all about us, and while no two states have the same identical laws, there are many similarities.

Misrepresenting a product, telling the consumer it will do something that it will not do, is clearly fraud. In most states, **failing to tell** the consumer/customer that there is a **likelihood** that his TVRO system will **not function as well** (or not at all) in a few years is also fraud. Even if you, the dealer, are not aware of this problem, **the law presumes that you do know about the problem** since you are considered an 'expert' in this field of endeavor.

The antenna manufacturers may be the most vulnerable in this situation unless they can satisfy consumer protectionists that there has been an effort to inform each segment of the distribution chain of the 'limitations' of the (small antenna) product. One approach being considered is to clearly label the antenna with a difficult-to-remove metal or laminated plate which spells out the minimum operating conditions of the antenna. Such a plate might read:

> **"This 8 foot aperture TVRO antenna, manufactured by XYZ Manufacturing Company, is designed for use in areas with minimum EIRP footprints of 34 dBw, or more, with satellite to satellite spacings of 4 degrees or more. Reception quality in lower footprint areas, or at closer satellite spacings, is not**



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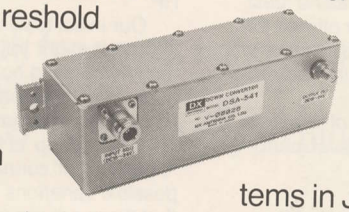
Now you can have top quality performance for a surprisingly reasonable price. The DSA-643 Satellite Receiver from DX features dual, **block downconversion**—unique for receivers in this price range. The DSA-643 uses a discriminator circuit for signal demodulation; a full 30 MHz bandwidth; and a unique threshold extension circuit. These features add up to a low threshold carrier to noise ratio, commercial quality reception and low cost installation in any system.



DX also provides the DSA-541 Block Downconverter. It features a highly stable ceramic resonator, with a fixed frequency of 2800 MHz. Stability is maintained at a remarkable ±1 MHz over the entire −30° to +50°C temperature range. So you can install the downconverter out of doors, at the dish, without concern for frequency drift caused by temperature changes year after year.

The innovative DSA-643 Satellite Receiver and DSA-541 Block Downconverter are brought to you by DX, one of the most respected names in satellite television reception systems in Japan and around the world. DX also provides line amplifiers, power dividers, and other block downconversion-compatible accessories.

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guaranteed and use under such conditions is not recommended by manufacturer.

Of course, before any antenna manufacturer can 'safely' hang such a plate on his antenna(s), he had best get the antenna to a test range where the actual gain, sidelobe patterns and 'E' and 'H' plane envelopes can be measured!

Summary—

Recent trade shows have produced an increasing number of small dish packages built around antenna diameters between 6 and 9 feet. Such packages seem 'viable,' **today,** because their appearance in the marketplace has coincided with the recent launch of higher power satellites.

There is, however, a seven to nine year cycle at work here; a cycle created by the new-bird launch-schedule. We are riding the crest of a 'high signal level wave' which will, ultimately dip into a trough. It is a ltle bit like surf boarding; when you are at the top or leading edge of the wave, the ride is fine. Somewhere ahead is the beach, however. And to complicate matters, a storm is brewing off to the side which will bring strong waves towards the surfer from the side, possibly before the board reaches the beach. The storm (closer spaced satellites) looks less ominous at the moment than the beach ahead. It's a gamble that the surfer will reach the beach before the storm hits. A 'wipe out' is at least a 50-50 possibility.

ROBS RECEIVER

NOISE TESTS

NO NOISE Is Good News

During the month of May the Royal Order of Bloodsuckers (ROBS) met in Boca Grande, Florida to evaluate one aspect of TVRO receiver design (see **Coop's Comments,** this issue). Utilizing equipment provided on loan by Hewlett Packard, along with HP field applications engineer **Mark Davis,** the ROBS group spent two long days working out a series of test programs for future, in-depth, industry wide appraisals of TVRO receiver system performance.

The purpose of the May testing was not to develop hard, 'quotable,' numbers for receiver units submitted for test; rather it was an attempt to arrive at **appropriate testing procedures** which could be employed in the future in the eventual side by side comparison of receivers in the marketplace.

Approximately 20 TVRO receiver manufacturers were contacted by **CSD,** with the request that they provide, on loan for ten days or so, a current production model unit. Eight of the 20 suppliers cooperated by providing a unit for test. As promised to those providing receivers, no published results of the testing will appear here. There was no 'best' receiver, and no 'worst' receiver in the eight. Each receiver offered the ROBS group, and the HP field engineer, different opportunities to arrive at 'standardization testing systems' for future all-industry receiver tests to be sponsored by **ROBS** and **CSD.**

Receiver testing might break down into a number of areas of concern. For example, in the complete analysis of receiver performance, the following areas must be measured:

1) Downconverter linearity (flatness)
2) Downconverter noise figure (i.e. stand-alone threshold)
3) Downconverter gain
4) Downconverter 'match' to the LNA ahead of it, and the demod/receiver following it
5) Receiver linearity (flatness)
6) Receiver noise figure (i.e. stand alone threshold, in the IF range)
7) Receiver gain
8) Receiver match (to the cable feeding signal from the downconverter, and through the cable, to the downconverter itself)
9) Receiver IF bandwidth
10) Receiver threshold for both static and moving video
11) Receiver video bandwidth and phase purity
12) Receiver clamping (ability to eliminate energy dispersal waveform)

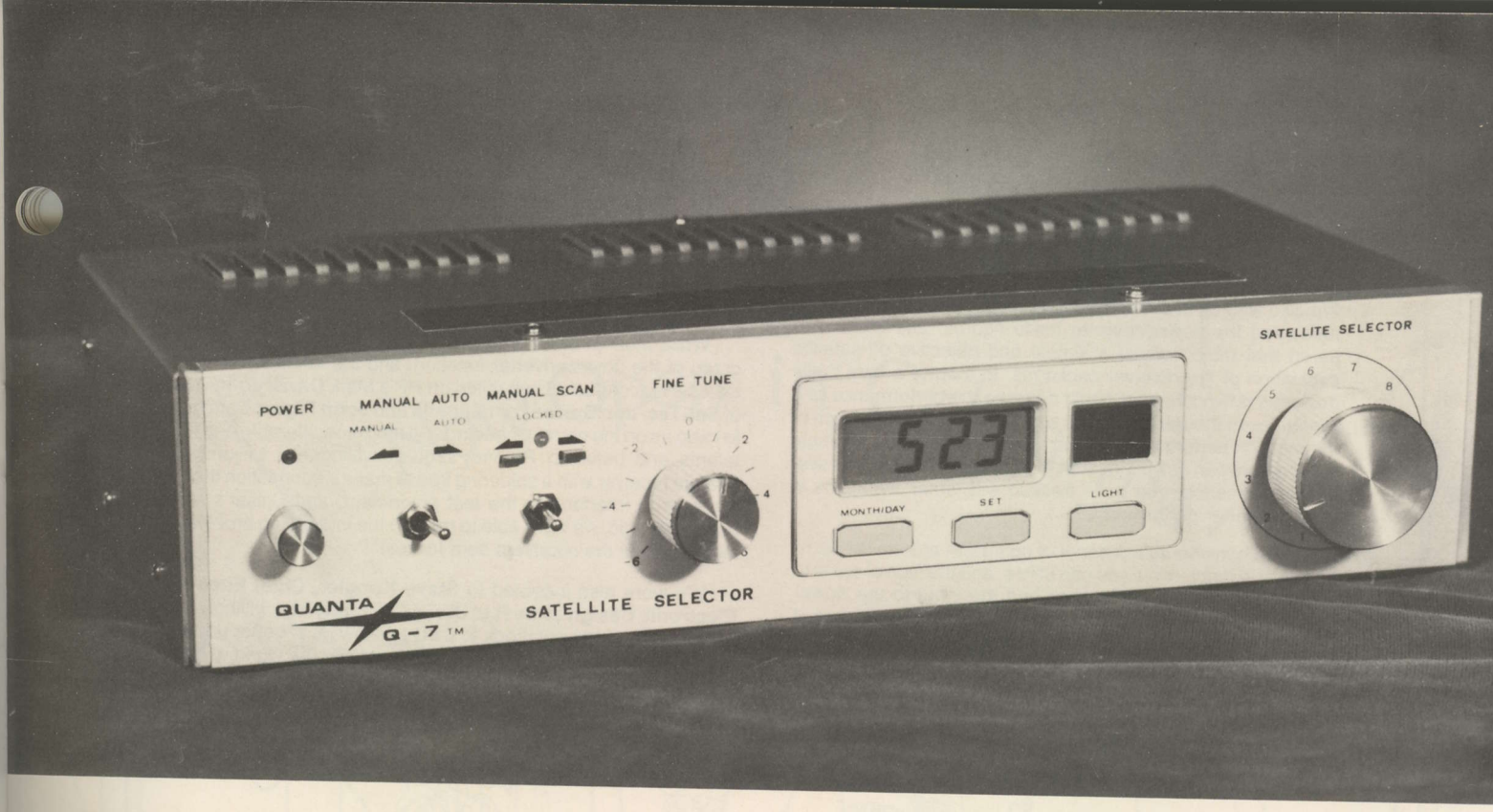
Additionally, a series of tests to evaluate receiver audio recovery, and a series of tests to evaluate performance of the entire package (downconverter **plus** receiver), would have to be developed. Ultimately, from all of this testing procedure it would be possible to look at both complete packages and parts of a system's performance. Even receiver 'radiation' (the undesired emission of the local oscillator signal, out of the receiver into the surrounding area, by whatever path it might take) would be checked and measured. It is, to say the least, an ambitious project requiring thousands of man hours and plenty of donated time and equipment. A special note of thanks to HP's Mark Davis, and the company itself (Hewlett Packard) for agreeing to work with us to get the project underway. Having a few tens of thousands of dollars in test equipment, and a man intimately familiar with running that test equipment, on 'loan' for a few days is no small investment by HP.

Our initial tests were more for the experience than the hard numbers that might result. While 8 manufacturers did supply receivers, many others did not so the entire spectrum of receivers could not be evaluated. That was probably good since one of the first things we discovered was that each receiver package often requires an entirely different 'set-up' of the test equipment interfacing (the 'Goes-into' and 'Goes-Out-of' connections), and we were not as prepared for all of the possible variations as we might have been. What we learned here is that there are very few 'standards' in force for connectors, powering schemes to the downconverters, and the gain and noise figure 'target ranges' of the original design engineers.

DOWNconverter Noise Figure

The most repeated testing dealt with the measurement of the noise figure of the downconverter units. Our rationale here was several sided.

1) While it is true that the noise figure of the system is set or established **almost** totally by the noise temperature (or noise figure) of the LNA (low noise amplifier), there are (or can be) some subtle degradations of the 'system noise temperature'



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caused by the design parameters chosen for the downconverter. We wanted to see what the real world impact of those design variations might be on system performance.

2) We also wanted to see what 'patterns' might emerge when we measured the downconverter noise figures, and then compared that table against a simple and objective off-satellite evaluation of the receiver packages. In theory, a very badly designed downconverter could degrade the performance of a system even though the LNA is supposed to establish much of the system 'performance' rating. Might not there be a simple parallel between downconverter design/performance, and system performance, that even tracked with small variations in downconverter performance?

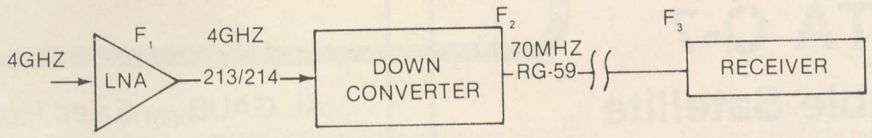
3) There is a considerable amount of confusion around concerning just how much cable you can utilize, and the type of cable to utilize, between the LNA output and the input to the downconverter (typically RG213/214 type cable), and, the output of the downconverter and the input to the receiver (typically RG-59 type cable since the downconverter output is at 70 MHz in most systems). We wanted to compute the tradeoffs going on here in the hope that we could help dealers better understand the design constraints they were facing when they elected to 'modify' the receiver manufacturer's recommended cable lengths while making an installation.

While most of those attending the sessions had at least a basic grasp of the downconverter function, and the noise figure and gain tests being conducted, we relied on HP's Mark Davis, **John Ramsey** of **Sat-Tec, Jon Spisar** from **Canada** and **John Figura** from **Intersat** to keep us on the correct 'heading.' All have considerable engineering talents and between Ramsey's quick willingness to jump into a strange receiver with a soldering iron to make a connection that would allow us to interface to the test equipment, and Spisar's carefully reasoned logic, we were able to resolve the interfacing problems with all but one of the receivers sent for test.

We were also indebted to **Steve Koogler, Chief Engineer** for **Electronic Design** at the **R.L. Drake Company** who willingly opened up his engineering notebook to **CSD** to allow us to better understand the design equations and planning that go into the world of selecting

CALCULATING NOISE FIGURE DEGRADATION CAUSED BY CABLE ATTENUATION

NOISE FIGURE = 1.50 dB ——— 15dB ——— 8dB
NOISE FACTOR = 1.41275 ——— 31.65 ——— 6.31



GAIN/ATTEN. 100,000 (+50dB) 1/2.5 (−4dB) 200 (+23dB) 1/2.8 (−4.5dB)

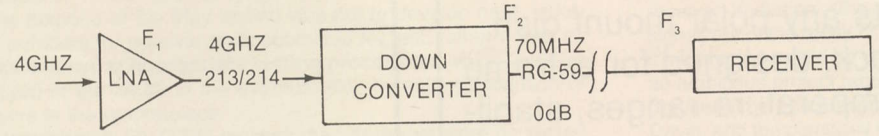
NOISE FIGURE DEGRADATION = 0.003dB

MOST TYPICAL INSTALLATION

$F_{23} = 31.65 + \frac{6.31 - 1}{200(/2.8)} = 31.724 = 15.014dB$

$F_{12} = 1.41275 + \frac{31.724 - 1}{100{,}000(/2.5)} = 1.4135$

$F_{12}dB = 1.503dB$



GAIN/ATTEN. 100,000 (+50dB) 1/2.5 (−4dB) 200 (+23dB)

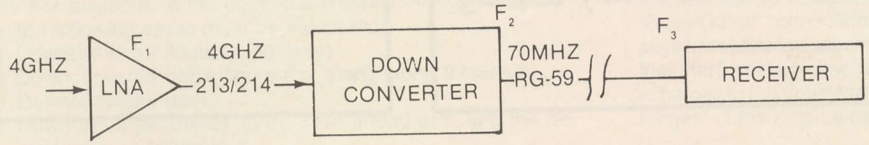
NOISE FIGURE DEGRADATION = 0.03dB, or 3°K

WORST CASE INSTALLATION
(NO COAX LOSS AT 70MHZ)

$F_{23} 31.65 + \frac{6.31}{200} - 1 = 31.677 = 15.007dB$

$F_{12} = 1.41275 + \frac{31.677 - 1}{100{,}000(1/31.5)} = 1.4224$

$F_{12}dB = 1.53dB$



GAIN/ATTEN. 100,000 (+50dB) 1/2.5 (−4dB) 200 (+23dB) 1/12.5 (−11dB)

NOISE FIGURE DEGRADATION = 0.003dB

LONG 70MHZ COAX RUN

$F_{23} = 31.65 + \frac{6.31 - 1}{200(1/12.5)} = 31.98 = 15.05dB$

$F_{12} 1.41275 + \frac{31.98 - 1}{100{,}000(1/2.5)} = 1.4135$

$F_{12}dB = 1.503$

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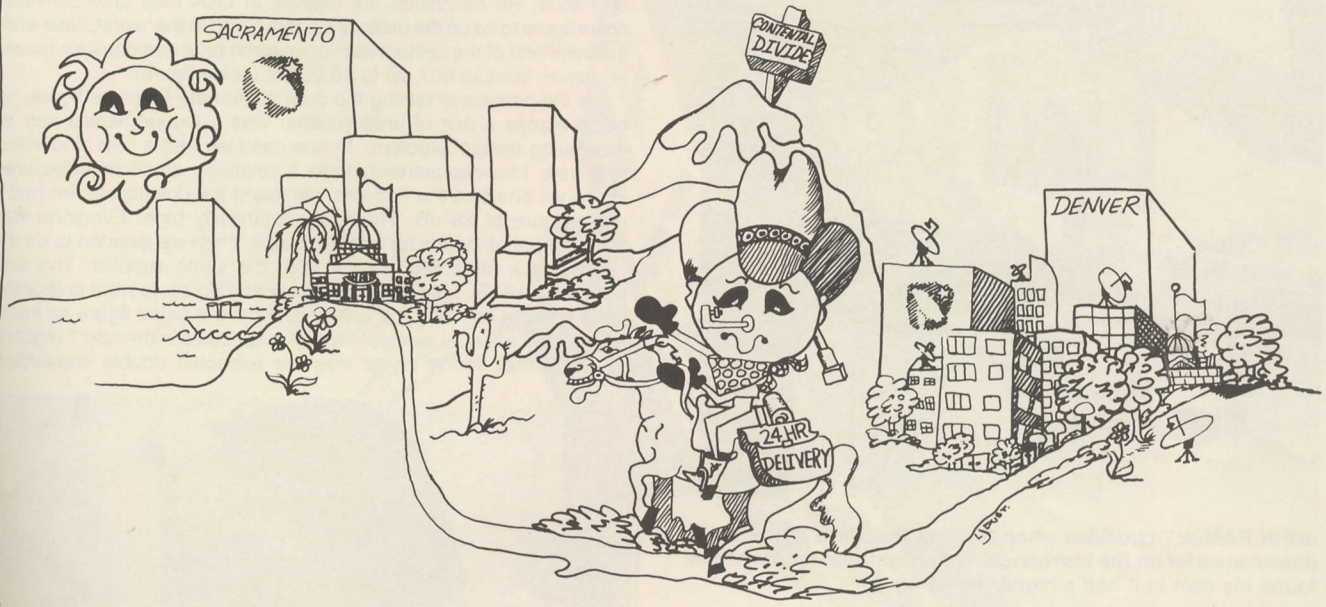

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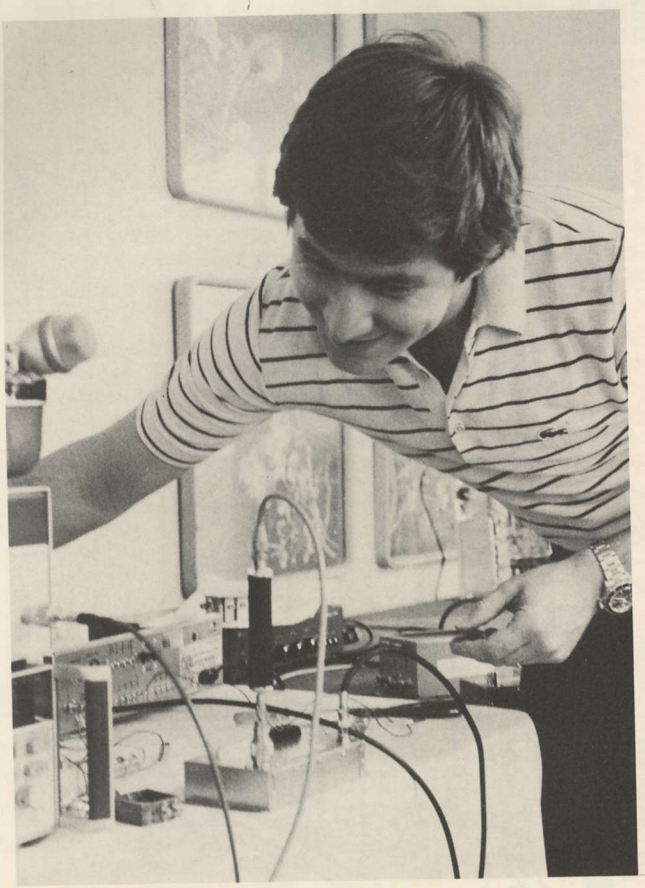


JOHN RAMSEY chuckles when he sees the noise figure of the downconverter on the test bench. The laughter ceased when he found his own unit had a higher noise figure!

downconverter and receiver operational design goals.

Borrowing a few pages from the Drake engineering design book, these thoughts from Koogler. "**I agree that it is certainly important to properly choose the LNA and to use the proper cable lengths to obtain optimum performance** (from a system). **We have tried to eliminate any confusion in this area by including a table in our instruction manual which relates maximum allowable cable attenuation to LNA gain. We recommend using an LNA with at least 50 dB of gain. In addition, the ESR24 is purposefully designed so that it will not operate with signal levels** below **a minimum level. This insures that it is not possible to install a cable with enough attenuation to degrade the system noise figure noticeably. If too much attenuation is present, it is no longer possible to obtain a meter reading on the signal strength meter. At this** (flagging) **point, the picture very noticeably degrades if the input levels go below this factory set minimum.**"

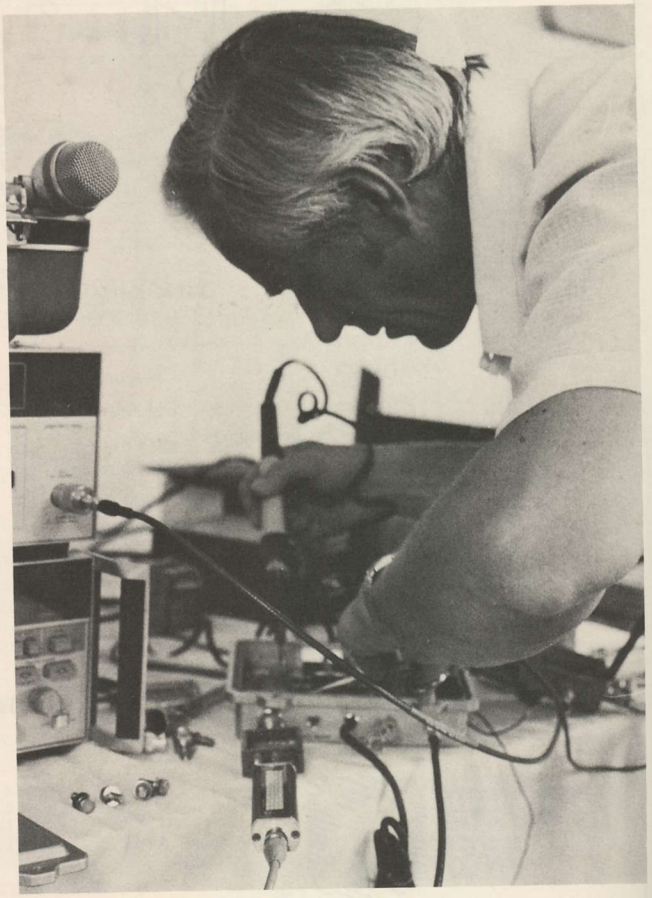
This is spelled out in a diagram here labeled '**Calculating Noise Figure Degradation Caused By Cable Attenuation.**' Using data supplied by Drake's Koogler, you will see that the noise figure is approached first as the combined noise figure of the LNA plus downconverter portion of the package, and then as the combined noise figure of the downconverter plus the receiver (demodulator) proper portion of the system. Three different types of installations are covered:

1) '**Typical**' installation where there is 4 dB of cable loss between the LNA and the downconverter (roughly 20 feet of RG-213 cable, with connectors), and then 4.5 dB of cable loss between the downconverter and the demodulator (roughly 150 feet of RG-59/U type cable, and connectors).
2) '**Worst Case**' installation, where (surprisingly) the downconverter is mounted directly to the receiver/demodulator (i.e. there is no RG-59 interconnecting cable, or a very short piece of such cable) and 'all of the cable loss' is found in the RG-213/4 cable that connects the LNA to the downconverter. This is the 'worst' situation because the receiver system is designed for (i.e. intended to compensate for) **some loss** in the small-cable RG-59/U line. By eliminating that line, and the loss that goes with it, the installer unknowingly causes himself some degraded performance. And here you thought no cable or very-very short cable runs were best!
3) '**Long 70 MHz Coax Run,**' which is the exact opposite of having the downconverter and the receiver 'on top' of one another. Here we have 11 dB of RG-59/U loss, or about 400 feet of cable.

Based upon Koogler's notebook, there is a relatively narrow range of system noise figure performance change in any of these three scenarios. He calculates the change in LNA Plus downconverter noise figure to be on the order of 1.5 to 1.53 dB in the 'worst' case while the back end of the system (downconverter plus demodulator/receiver) varies from 15.007 dB to 15.03 dB (noise figure).

In the process of testing the downconverters for noise figure, we came across a pair of units (neither was a Drake!) which had an interesting design 'problem.' In one case we had a pair of identical receivers (downconverters) from a relatively small manufacturer. When we checked the first one, we found the downconverter had a noise figure of 28 dB. That's astronomically high. Everyone was scratching their heads for a few minutes. Then we decided to do the same check on a second unit from the same supplier. This one measured 19 dB. That moved Ramsey and Spisar to want to take the case apart to see why the unit should have a noise figure so much higher than a typical receiver (most are specified in the 13-17 region).

What they found inside was the expected double conversion



COVER BOY . . . Jon Spisar of Canada makes a small power diversion modification in a Doug Dehnert downconverter so it could be checked for noise figure.

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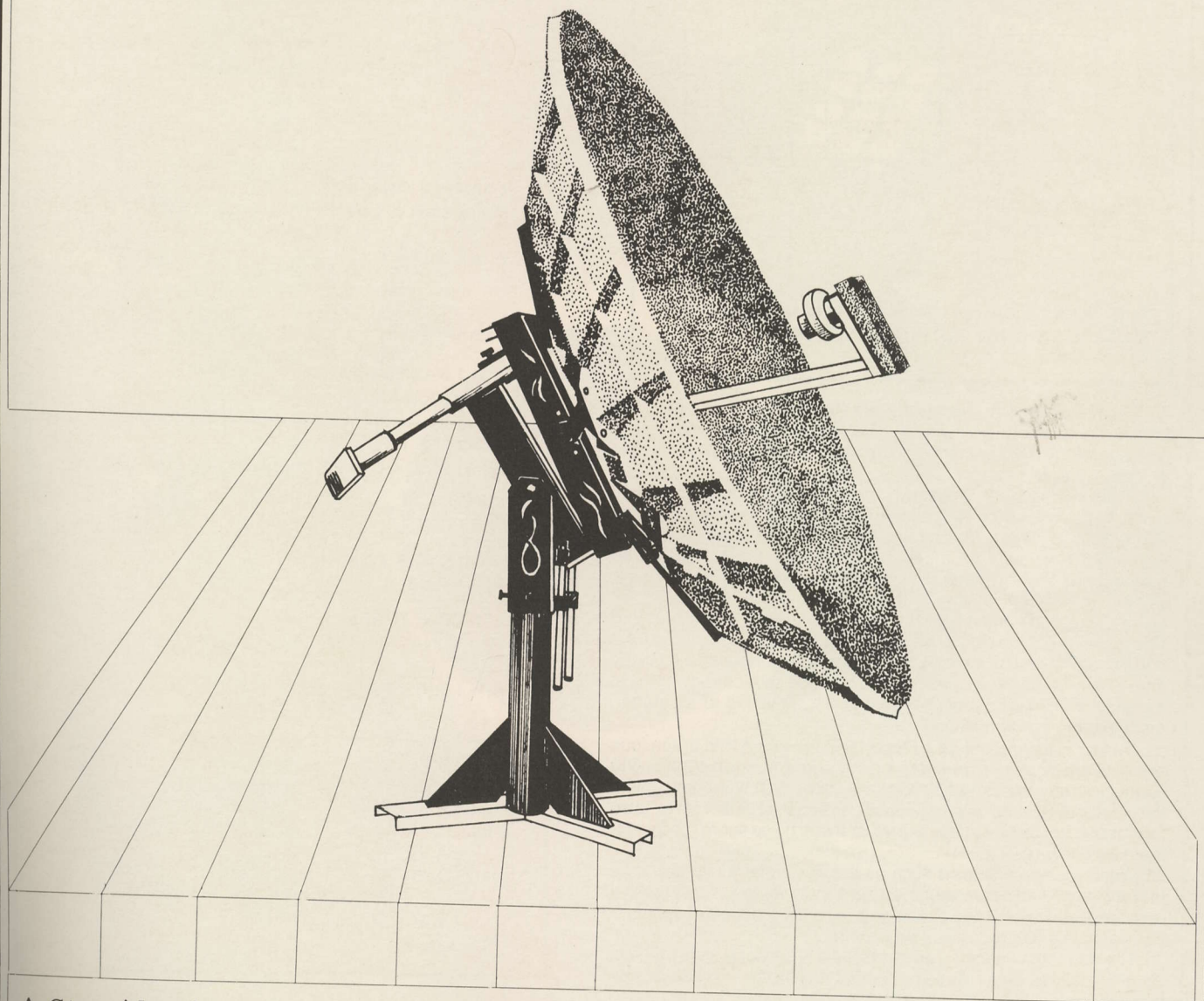

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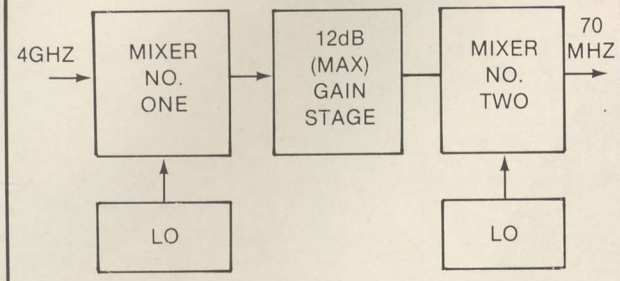
system; first the input signals (3.7 to 4.2 GHz) were taken into the input. Inside the box, they were mixed with a local oscillator **(see diagram)** and converted to a relatively high IF (frequency) range. This output was then fed directly into a 'gain block' device that amplified the output of the mixer at the (high) IF (frequency). Now, inside the same box and barely inches from the first mixer/conversion stage, was a second mixer stage with its own LO. Finally the output of this mixer, at 70 MHz, was sent into the cable to head for the receiver.



THIS DOUBLE CONVERSION SYSTEM HAD VERY BAD SPURIOUS SIGNAL OUTPUTS: SEE TEXT.

Because both of the local oscillators were in the same box, without benefit of any 'shielding,' there were large quantities of unwanted and undesirable LO product 'harmonics' coming out of the downconverter at 'both ends.'

When you attach a downconverter to the HP test set system, you measure noise figure by alternately turning the noise source on and off at a rapid rate. The noise source is inside of the HP test equipment. Normally when you turn it off, the noise figure of the downconverter can be 'read' on the meter. Not this time. There was so much unwanted signal coming out of the downconverter, at frequencies spread across the entire region from approximately 800 MHz to well over 4,200 MHz, that these unwanted 'spurious' signals 'fooled' the noise figure meter into thinking that the downconverter had a very high 'noise' level. It did if you consider the unwanted spurious signals to be 'noise'; they certainly were not contributing anything to the performance of the downconverter!

Oh yes; we found one other receiver in the group with a 'spurious signal' problem; a situation where the unwanted, and non-contributing harmonics from the receiver's local oscillator (LO) were getting into the HP test set via the output line, and causing the HP test set to 'false indicate' on its assigned task; to give us a true noise figure reading for the downconverter.

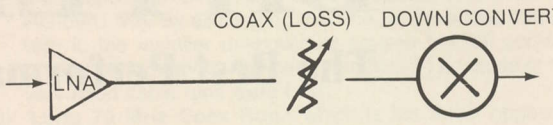
When we saw problems such as this, we were reasonably sure that unless we had a 'lemon unit' on our hands, we were really looking at receiver units which had been designed without benefit of appropriate test equipment, or testing procedures.

The downconverters tested displayed a reasonably wide range of (1) noise figures, and, (2) gain. Without identifying which units had what characteristics, here are the bulk of the results:

Unit Designation	Downconverter Gain			Downconverter Noise Figure		
	3.7 GHz	3.95 GHz	4.2 GHz	3.7 GHz	3.95 GHz	4.2 GHz
001 (*)	-1.2 dB	-1.3 dB	-1.4 dB	26.5 dB	28.0 dB	27.5 dB
002 (*)	-1.4 dB	-1.2 dB	-1.8 dB	19.3 dB	19.3 dB	19.3 dB
003 (*)	+13 dB	+13.2 dB	+12.5 dB	18.6 dB	18.5 dB	19.0 dB
004	**+24.0 dB**	**+24.0 dB**	**+24.0 dB**	**12.0 dB**	13.5 dB	**13.0 dB**
005	+17.5 dB	+18.0 dB	+17.7 dB	13.7 dB	**13.2 dB**	13.7 dB
006	+15.2 dB	+17.0 dB	+15.1 dB	17.6 dB	15.8 dB	17.5 dB
007	+20.0 dB	+20.7 dB	+19.8 dB	15.9 dB	15.3 dB	16.0 dB
008	+18.6 dB	+18.4 dB	+18.7 dB	13.8 dB	14.1 dB	13.9 dB

*—These units all had measurable spurious signals (harmonics of the local oscillator) present which could not be 'bandpass filtered out' of the test system to allow an 100% accurate reading of true receiver (downconverter) noise figure. Units 001 and 002 had a pair of mixer (downconversion) stages in the downconverter, with approximately 12 dB of gain tucked between the two mixer stages. Lacking adequate gain at the higher IF, there is no way the second mixer could perform adequately to create a usable system noise temperature.

CALCULATING DOWN CONVERTER NOISE FIGURE CONTRIBUTION TO SYSTEM NOISE TEMPERATURE BY VARYING COAX LOSS (LNA TO DC)



G = 50/30dB, F = 1.5dB — G_1, F_1

LNA TO DOWN CONVERTER — G_2, F_2

F = 12dB — G_3, F_3

EXAMPLE ONE
(50dB LNA, 1.5 dB NF, 5dB CABLE LOSS TO DC)

$$F_T = F_1 + \frac{F_2 - 1}{G_1} + \frac{F_3 - 1}{G_1 + G_2}$$

$$F_T = 1.5\text{dB} + \frac{4}{50} + \frac{11}{45}$$

$$= 1.5 + 0.08 + .24$$

$$F_T = 1.83\text{dB}$$

EXAMPLE TWO
(50dB LNA, 1.5dB NF, 10dB CABLE LOSS TO DC)

$$F_T = 1.5\text{dB} + \frac{9}{50} + \frac{11}{40}$$

$$= 1.5 + .18 + .28$$

$$F_T = 1.98\text{dB}$$

EXAMPLE THREE
(30dB LNA, 1.5dB NF, 5dB CABLE LOSS TO DC)

$$F_T = 1.5\text{dB} + \frac{4}{30} + \frac{11}{25}$$

$$= 1.5 + .133 + .44$$

$$F_T = 2.07\text{dB}$$

EXAMPLE FOUR
(30dB LNA, 1.5dB NF, 10dB CABLE LOSS TO DC)

$$F_T = 1.5\text{dB} + \frac{9}{30} + \frac{11}{20}$$

$$= 1.5\text{dB} + .30 + .55$$

$$F_T = 2.35\text{dB}$$

As you can see, after tossing out the unusual (that's being charitable) design of units 001 and 002, we have the following variations in gain and noise figure:

1) Highest noise figure measured — 19.0 dB
2) Lowest noise figure measured — 12.0 dB
3) Highest gain measured — 24.0 dB
4) Lowest gain measured — 12.5 dB

Now, since there are some substantial variations here, how can you as an installer 'protect' yourself from making a poor installation when you know (from the manufacturer's specifications sheet, for example) that

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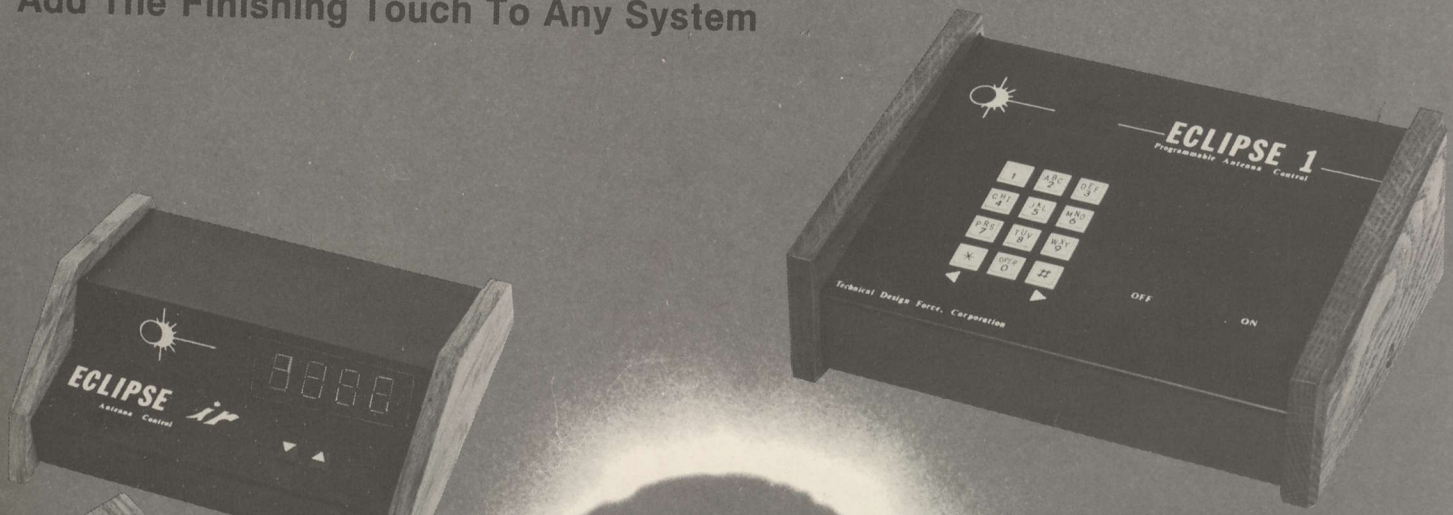
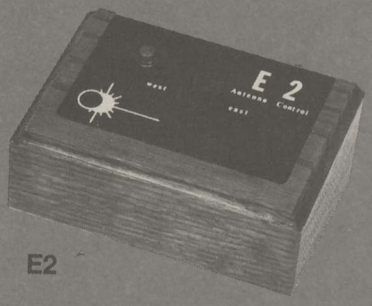
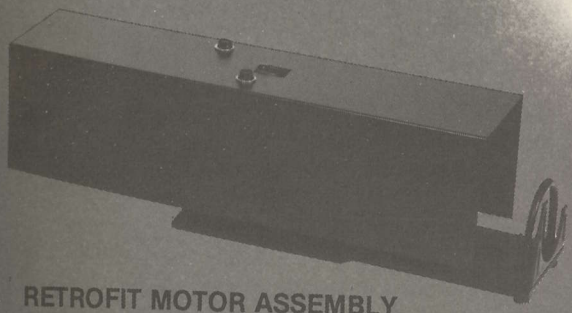


ECLIPSE 1

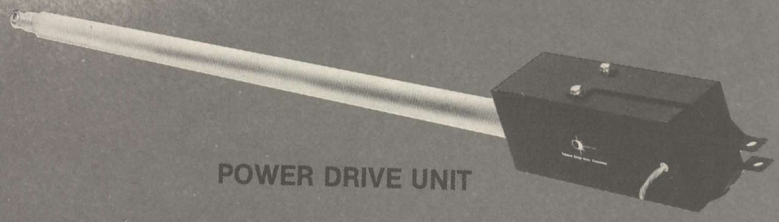
ECLIPSE *ir* infra red remote



E2



RETROFIT MOTOR ASSEMBLY



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USS's Doug Dehnert (right) **and host Tom Harrington inspect a high grade type 'F' fitting which Dehnert designed for his MasPro receiver line system. Harrington, the industry's weatherproofing sealing expert** (COAX SEAL) **approved.**

gains are either low or high, or, noise figures are either low or high?

With the assistance of John Ramsey and Jon Spisar, we have prepared a pair of diagrams here. The first is labeled **'Changes in Downconverter Noise Figure.'** What you see here is a comparison of what might happen to your installation if you elected to use a receiver package with a wide range of noise figure(s). In each case, the LNA is a 50 dB gain LNA with 1.5 dB (120 degree) noise temperature. There is 5 dB of cable loss (approximately 25 feet of 213/214, plus connectors) between the LNA and downconverter. Four different downconverter noise figure 'benchmarks' are provided; 12 dB, 15 dB, 18 dB, and then to catch the sloppy guy at the top of the list, 25 dB.

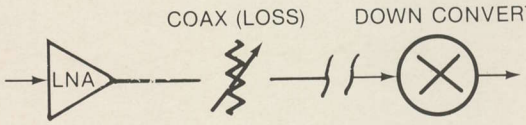
The number to study is the $\mathbf{F_t}$ appearing at the end of each 'case study.' It varies from 1.82 dB for a 12 dB noise figure 'DC' up to 2.11 dB for a 25 dB noise figure 'DC.' Yes, there **is** measureable **loss in system sensitivity** with a higher noise figure downconverter. No, it is not quite as dramatic as it might be.

The next study is headlined **'Calculating Downconverter Noise Figure Contribution to System Noise Temperature By Varying Coax Loss (LNA to 'DC').'** That simply means, what happens when you change the loss (cable length or cable quality) between the LNA and the downconverter, or, you elect to use a lower gain LNA (30 dB gain is sampled here as an example)?

Once again the number to watch is the $\mathbf{F_t}$ at the end of each 'example' system. Starting with a 50 dB gain LNA, 1.5 dB (120 degree) noise figure, and progressing through 5 dB and 10 dB lengths of 213/214 LNA to 'DC' cabling, down to 30 dB gain (still 120 degree/1.5 dB noise figure) LNAs, we find that the F_t varies from a low of 1.83 dB (best case) to a high of 2.35 dB (worst case).

This is not the full story, but it is a start on a very complex subject. To really understand the full noise temperature/figure contribution of the full system, you really need to start way back at the antenna surface and feed where the 'antenna noise temperature' is an important factor to all that follows. Then the entire system all the way through to the last IF amplifier stage has to be 'married' into the calculations so that when you finish you will have the effects of all parts of the system under consideration.

COMPARING CHANGES IN DOWN CONVERTER NOISE FIGURE



GAIN = 50dB
F = 1.5dB
G_1 F_1

G_2 F_2

G-VARIABLE
G_3 F_3

EXAMPLE ONE
(50dB LNA, 1.5dB NF, 5dB CALBE LOSS, 12, and 15, 18, and 25 dB NF DOWN CONVERTER)

12dB NF DC

$$F_T = 1.5dB + \frac{4}{50} + \frac{11}{45}$$

$$F_T = 1.5 + 0.08 + .24$$

$$F_T = 1.82dB$$

15dB NF DC

$$F_T = 1.5dB + \frac{4}{50} + \frac{14}{45}$$

$$F_T = 1.5 + 0.08 + .31$$

$$F_T = 1.89dB$$

18dB NF DC

$$F_T = 1.5dB + \frac{4}{50} + \frac{17}{45}$$

$$F_T = 1.5 + 0.08 + .38$$

$$F_T = 1.96dB$$

25dB NF DC

$$F_T = 1.5dB + \frac{4}{50} + \frac{24}{45}$$

$$F_T = 1.5 + 0.08 + .53$$

$$F_T = 2.11dB$$

WHAT We Learned

Obviously not all downconverters are created equal. You can get yourself into trouble by not giving proper consideration to such things as cable lengths and types (i.e. the loss contributed by cables). You can get yourself into trouble by eliminating the cable between the LNA and the downconverter (we'll see why in a subsequent issue), or, the cable between the downconverter and the receiver. You can also get yourself into trouble that seems impossible to cure by simply selecting a receiver that does not do an adequate job of insuring that 'harmonics' of the local oscillator (LO) stay out of the input and output ports (connectors) at either

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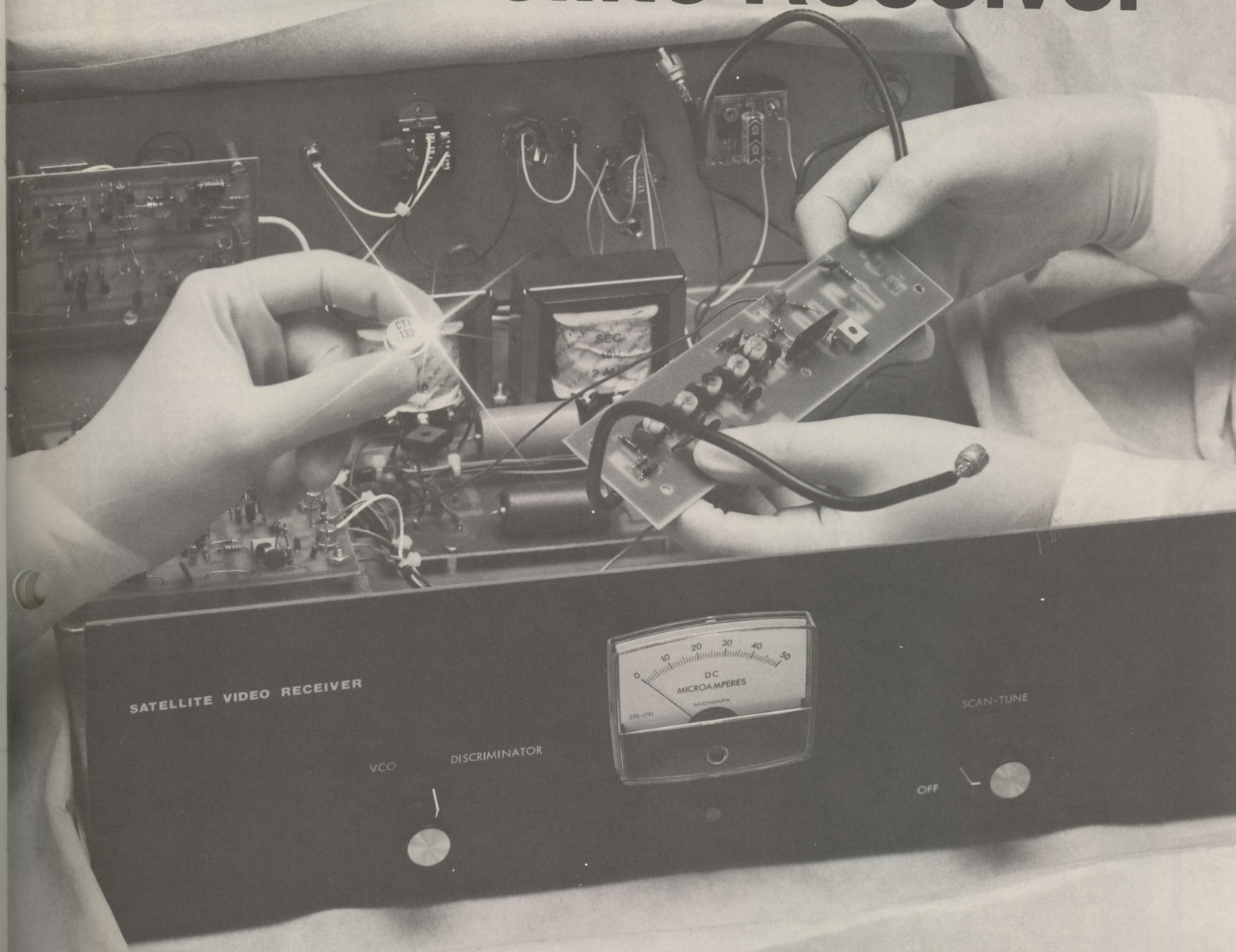

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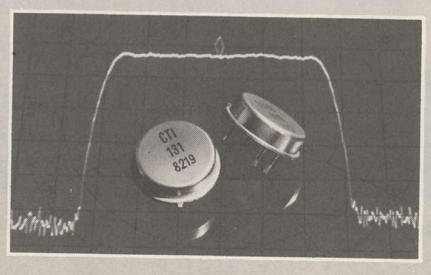

It all adds up to better reliability, cost efficiency and optimum signal reception.

We will be pleased to provide technical literature and advice on circuit design to start the operation that will put more life into your next satellite receiver.

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end of the box. If those unwanted spurious signals do nasty things to an HP test set, you can imagine how much **good** they do floating into your TVRO demodulator, or your LNA. Not much!

If you are a regular watcher of TR22's Saturday **'Sat Scene'** show, be on the lookout for a videoape report of the ROBS receiver noise figure tests late in July (exact scheduling not set at time of publication). Between this report and the **Sat Scene** report, we guarantee you'll have a new appreciation for the problems faced by receiver designers in this field.

PROVO MAY 14th

ECI'S 11 FOOTER

11 FOOT/ .3 f/D

There has been a well supported view for all of the years there has been serious interest in TVRO (and ARO) systems that if you want to create a dish with maximum gain, you stick to shallow dishes with a relatively long focal length to diameter relationship. Pioneering work done in our field by **Steve Birkill** (the Scalar/Ring Feed, first reviewed in **CSD** in February of 1980; page T9) led to increased prime-focus antenna design gain when the then-common 'horn' or 'button hook' feed was replaced with a Scalar configuration. Birkill's approach to the Scalar feed was motivated by both a desire to increase antenna system efficiency, and, his unique Intelsat receiving situation in the United Kingdom.

It remained for Taylor Howard and Bob Taggart, setting up shop in June of 1980 under the brand new name of **Chaparral Communications,** to commercialize the Scalar feed. First announced in the June (1980) issue of **CSD,** and subsequently first shown at the San Jose SPTS event that July, the 'feed market business' would never be the same again.

Maximum gain, we are told, is achieved with a dish in the region of .5 f/D. That means the distance between the center of the dish surface and the feed's focal point location will be .5 or 50% of the diameter (D) of the dish. A ten foot diameter dish would have a 5 foot (out front) focal/feed point. **The best antenna 'pattern',** that is, an antenna that has been designed to produce the best rejection of signals 'off axis' (such as from adjacent satellites in the Clarke orbit belt), occurs not in the region of .5 f/D but rather down in the .25 to .3 f/D region. A dish that is so designed typically compromises some of its gain capability for improved pattern.

These have been general 'design rules' of parabolic antennas for many decades. The rules are now apparently being 'bent' a little by people who wonder what you might have to do to modify the feed itself in order to preserve good gain with a dish that was initially designed for best rejection of interfering signals.

Those who attended the just completed Can/Am '83 show had the opportunity to see and learn about the latest generation of dishes; antennas with f/Ds in the .3 region, but equipped with 'new generation feeds' which claim to give gain equal to or better than traditional Scalar feed systems dishes with .4 region f/Ds. The subject becomes especially relevent now because of the recent FCC determination that satellites will over the next decade become closer and closer together (see report page 8, this issue of **CSD**).

Engineered Communications, Incorporated (ECI) of New Brunswick, N.J. is one of the newer entrants into the TVRO antenna field, and their approach with an 11 foot diameter dish is to optimize the system for maximum rejection of interference, and, using the latest generation of .3 f/D feeds, maximum gain. ECI's Walter Grebis brought one of his antennas to the Providenciales test range in the middle of May and this is a report on the antenna's assembly and performance.

WALTER GREBIS and his 11 foot .3 f/D dish with Seavey feed. Standard mount, according to Grebis, is by South River. For stability in windy area, we do NOT **recommend singular pole mount used here!**

ECI's Grebis is an industrial design engineer. Tooling, metal fab-

rication, and packaging are his strong points. His interest in TVROs began because he decided he wanted a terminal of his own. He researched the available professional literature, and without any awareness that there even was a viable home TVRO industry, followed MIT and other library reference literature to the eventual paper design of his present antenna. It was only after he had designed the antenna for his personal use that he discovered the plurality of products already in the field.

The first models did not work very well. That puzzled Grebis since he knew with his background that the surface was extremely accurate (±15,000ths) and the dish was capable of performing better than it had. He was using a standard Chaparral feed at the time, and was not yet aware that you don't stick a feed designed for a wide range of f/Ds (but more specifically, for an f/D in the .4 region), and obtain maximized gain with a .3 f/D dish.

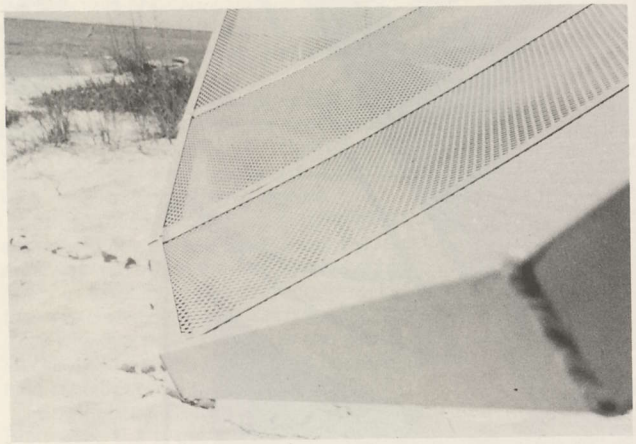
Grebis chose the .3 design because the literature taught him that this was a desireable thing to do if you were going to be using the antenna in a region that was likely to have heavy terrestrial interference, and noise sources. With a dish in the .3 region, all of the literature pointed towards considerably improved rejection of Bell and other interference. There are plenty of Bell microwave circuits in the northeast, and he knew that he didn't want to end up losing a bunch of channels to Bell TI. **The lack of gain was perplexing.**

As luck would have it, his path crossed that of **John Seavey.** Seavey is a feed designer with more than twenty years of experience. He began building optimized feeds for microwave antennas inside the shop of a major commercial antenna manufacturer back in the 60's. Eventually he went out on his own and began contracting feeds for firms such as Microdyne/AFC. Seavey was looking at the special feed problems associated with dishes in the .3 region when he and Grebis crossed paths.

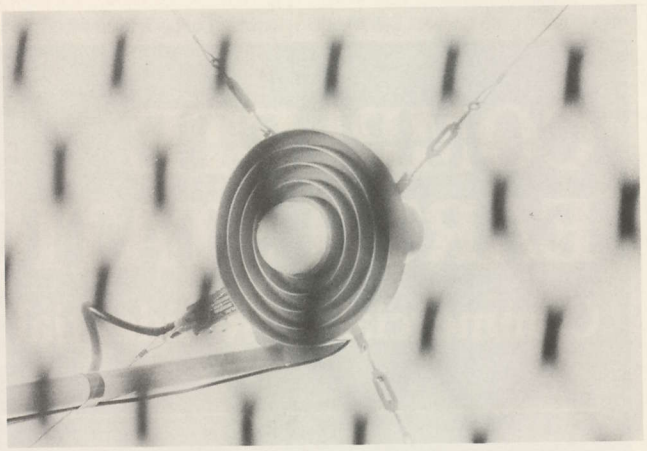
Seavey feeds have always been very 'stout' and very well built. In our industry they would be considered expensive and perhaps be considered 'structural overkill'. Seavey wanders about in the same school that puts antenna systems in the Artic or other hostile environments. This shows in his products; you could run over a Seavey feed with a tank and it would probably still retain shape, and function.

Armed with some proto-type 'special' Seavey feeds for a .3 system, Grebis went back to work on his gain problem. He saw an immediate improvement in the 1.0 to 1.5 dB region. Now he felt he was getting closer to the gain which he had hoped to achieve. Best of all, from Walter's point of view, the antenna had the designed-in-ability to function even close by to strong Bell microwave circuits.

The 11 foot ECI antenna, with a companion .3 Seavey feed (equipped with a polarization rotation system built into the feed) and an companion Microtenna Associates, Inc. 'Star-chaser' drive and controller system were brought to Providenciales on May 12th. Grebis suggested that approximately 25 of his antennas had 'gone out the door' at that point in time, making it plain that this was a brand new product with only limited field experience.



SEAVEY feed looks different, inside and out. Inside are 'dipole resonators' which Seavey claims improve feed efficiency for .3 feed system.



EIGHT REFLECTOR panels in all, each of which is broken into three sections, resulting in 24 separate 'curved' panels for full dish.

To save on excessive freight costs to the Turks and Caicos, the 'normal' mount system supplied with the ECI 11 foot antenna was left behind in New Jersey. We substituted a 4 inch diameter steel pipe which is fine for test but for long term stability would probably be a little on the risky side; especially in an area with high winds. The standard mount is a South River Product, very similar in an design to the mount which many users of the Harris Delta Gain (for example) employ.

The antenna consists of a set of 8 pre-fabricated reflector panels, a feed support, and a Polar Axis elevation assembly. Less the beefy South River mount, the entire package weighs in at around 100 pounds.

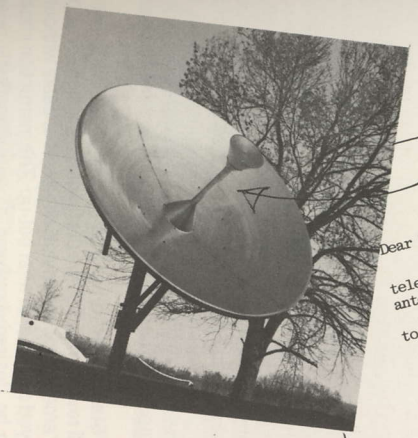
The industrial design experience of Grebis shows in both the present generation of instruction manual, and, the way the antenna assembles. While we were pouring a suitable concrete pier in a hole dug in the sand adjacent to Provo's Island Princess Hotel, Grebis went to work on the assembly of the 8 panels. Close inspection of the panels reveals that the expanded/extruded surface is 'laminated' inside of a specially designed aluminum sandwich. There are no metal screws or clips to hold the surface in place; it is 'pressed' and fitted into place in such a way that it cannot move once 'laminated'.

Each of the 8 panels is sub-divided into a trio of sub-sections. This means that while you have 8 total panels to handle, you are actually assembling an antenna that has broken the 11 foot diameter surface up into a total of 24 (8 x 3) reflector panels. One way to get better gain with any sectionalized dish, or course, is to break the surface up into as many 'small', essentially flat (in the circumference direction), panels as possible. That's why dish antennas with many panel sections usually out-perform those with fewer (essentially flat) panels; the overall dish comes closer to being a replica of the ideal parabolic curve.

Grebis placed the eight panels onto a flat piece of concrete patio and we timed him in getting the full surface assembled; 56 minutes and ten seconds. Not bad. By now the concrete was poured but hardly dry so everyone knocked off until the following morning.

Assembly of the Polar Axis Elevation Assembly took another hour or so and in another five minutes the dish was on the mount. From packing crate to 'people on the screen' a total of about 2.5 hours elapsed. Again, not bad.

Since the system is installed on a round piece of pipe, the alignment of the system is quick and straight forward, using techniques worked out more than a generation ago. First you use an inclinometer to set the elevation angle to the appropriate angle that corresponds with your location. The next step is to adjust the motor drive (or hand crank) so that the system has the proper 'look angle' that corresponds to a known bird location; in our case, 20 degrees elevation for F3R. Now loosen the bolts that secure the antenna to the mount and rotate the antenna on its own axis. You should find the desired bird almost instantly. We did and sure enough the polar axis support was zeroed in on true north.



optional Cassegrain feed!

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Second, we don't use steel, or sheet metal, or even stainless. We use the same stuff the pros use - ALUMINUM!

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David Brough

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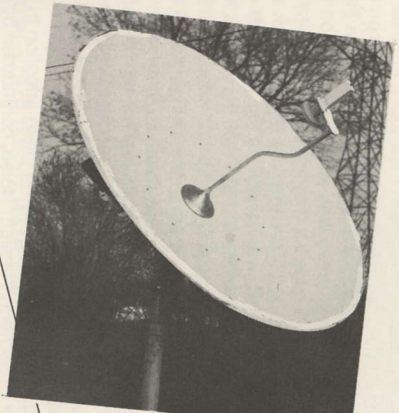

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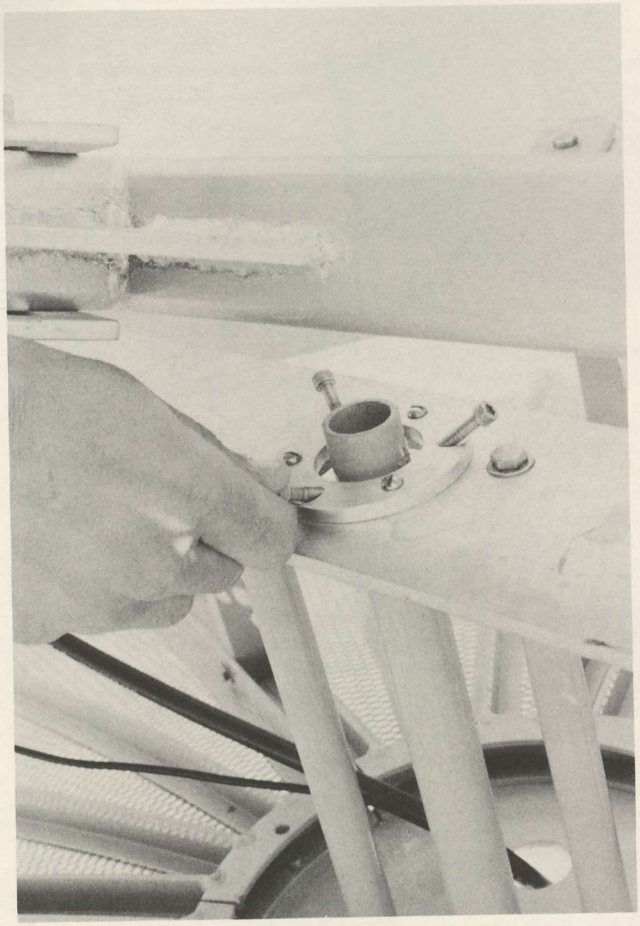
800-643-8324 608-647-4643

ECI supports the feed out in front of the dish with a mounting pole that fits through the dish center plate to a fine tuning adjustment system at the rear of the antenna. Grebis then anchors the feed to the dish, in the front, with four clip-on 'guy wire anchors' that are turnbuckle adjusted.



The 'centering-fine-tuning' is an interesting system. At the very rear of the feed support pipe is a ring through which the rear of the support feeds. The ring is larger than the support pipe, and to secure the feed inside of the support ring there are three stainless steel adjusting screws. By alternating the adjusting screws in and out, you have an accurate method of setting not only the optimized focal **length** for the dish but the exact **center** in front of the dish for the feed system.

All of the hardware on the dish and support system is stainless steel. The mount is fully galvanized. Since the mesh surface attaches to the 8 panels/24 sub-panel sections with a 'laminated' process, there are no through the mesh pieces of hardware present to turn bad on you after the antenna is in the field for a while.

Performance

With a wide range of other test antennas in and operating, cross checking the performance of the 11 foot antenna system is pretty routine **(*).** Here is what we found.

Equipped with a 100 degree LNA, and feeding an AVCOM 2B receiver, the performance of the EC1 11 foot antenna system was plus or minus 0.5 dB with the Paraclipse 12 foot mesh antenna, and it averaged nearly 1.0 dB more gain than our Harris 10 foot Delta Gain reference antenna. That puts the ECI antenna in the top performance class.

The .3 f/D design, if Mr. Seavey has done his homework correctly with his optimized .3 f/D feed system, should be exceptional as you get lower and lower towards the horizon. By designing the dish and feed to reject terrestrial interference arriving at the dish from terrestrial sources, you are also getting a better than even 'break' with rejection of 'earth noise'; that troublesome problem that always enters 'the picture' when you are down under 20/25 degrees with your (small) dish.

Lacking a fully calibrated antenna **test range,** there is no accurate way to 'measure' the apparent 'earth noise contribution' from a dish as the antenna zeros in on satellites that are closer and closer to your horizon. Our F3R elevation angle, for example, is 19.4 degrees, while out F1 (Galaxy 1) look angle is 16.7 degrees. F5 is just a tad over 10 degrees. For comparison purposes we did simultaneous tests on the Harris Delta Gain, a Paraclipse 12 foot and the ECI 11 foot **on F3R.** Pure 'carrier' (i.e. received signal level) was almost identical on the Paraclipse and ECI antennas (the Harris was lower). Pure 'noise', a difficult measurement when you don't take the time to swap back and forth the identical LNA and cables, was lowest on the ECI. The net result, by a small margin of a few tenths of a dB, was that at **this low look angle** the ECI produced the best CNR (carrier to noise ratio).

However, when the Paraclipse and the ECI were taken to F4, a bird with a relatively high look angle here (over 60 degrees), the situation reversed; now the carrier was about equal on the two while the noise was substantially lower on the Paraclipse. Net result? On the highest look angle birds, the Paraclipse had a noticable 'lead' in system picture performance.

If this is confusing, you've not been paying close attention to the trade offs that go into any antenna design. Noise, contributed by the feed system, as a function of the feed's illimination pattern, is still a little bit in the 'black magic' area.

Practical Problems

The ECI antenna is exceptionally well designed as a structure. It appears to maximize gain, minimize unnecessary weight and possible points of antenna failure due to weathering. It obtains the high gain performance because it has a feed which is designed to compliment the dish's f/D. **Placing a** standard **Scalar feed on it would be a mistake.**

The manual, and remember that no more than 25 antennas had been produced at the time we tested the unit and received a manual, is exhaustive in the step by step assembly instructions. Generous, well-drafted drawings lead you through the step by step procedures required to assemble the antenna proper, and mount the feed. Both on-ground and roof-top mounting are detailed.

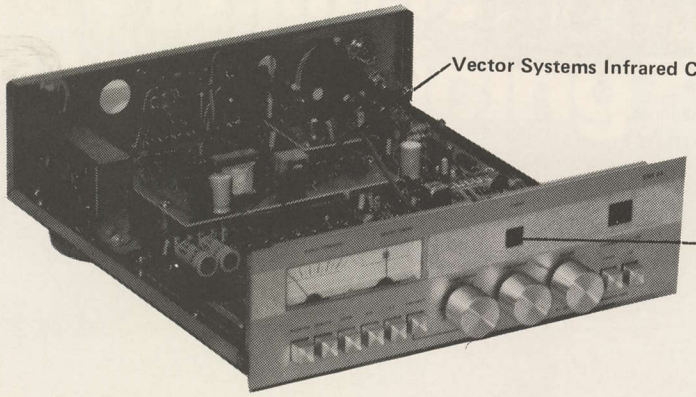
However, there are shortcomings with the manual. In particular, there is no manual attention to step by step dish alignment procedures. We ran into an 'anamoly' with the particular Seavey feed that came with the dish. Grebis was there to sort it out, but he had not been, an experienced hand would have analyzed the situation and done the exact opposite thing to correct problem. Grebis knew from past experience what to do with the Seavey feed; that information needs to be in the manual. Furthermore, the manual makes no mention of the feed since the dish is sold without a feed. Someone picking up the manual might assume that any normal Scalar type feed would work; indeed the drawings depict a feed that looks exactly like a standard Scalar. Since Grebis himself admits that the dish will not perform well with a normal Scalar, this needs to be pointed out in the manual as well.

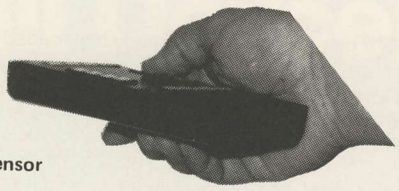
---

* - Antenna tests are conducted using known LNA and receiver electronics. Inside the United States, where footprints are more even and signal levels higher, it is difficult or impossible to properly assess system performance without a long and drawn out 'test range' procedure. That is not true in the fringe areas, such as the Turks and Caicos, where even **.2 dB changes** in system performance, on selected transponders which ride close to or just below threshold on normal 11-13 foot antennas, can easily be identified even without test equipment.

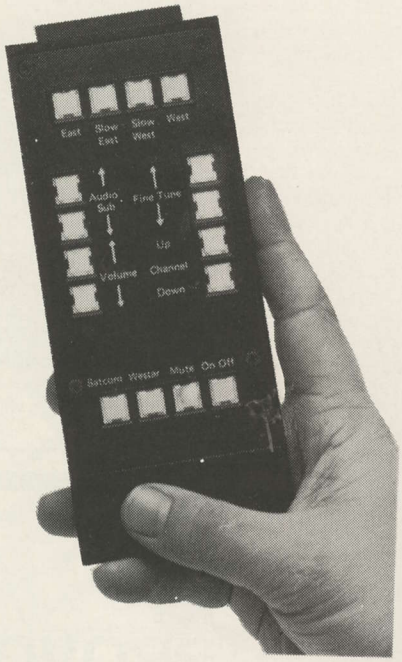
** - The **'Starchaser'** drive and controller, although not brought down for a full review, merit some discussion. The unit set up properly, accepted an 'emergency' extension of 40 feet of cable without hiccupping, and stayed operational after set-up. The instruction sheet leaves something to be desired, however, since it apparently refers to an earlier version controller with a different panel configuration. It is now in daily operation close to the Caribbean, on the beach, and the real proof will be how well, and how long, it continues to function. We'll revisit it in 90 days or so.

Infrared Conversion For Drake* ESR 24





If you like the excellent performance of the Drake ESR 24, but want the convenience of infrared wireless remote, look at this great idea. Our conversion kit mounts right inside any Drake ESR 24 and connects in a few minutes. Only two wires are soldered to the circuit board while all other connections are made with a plug or rear panel screw terminals. The power switch hole in the front panel becomes your infrared window, since power is switched with the remote.



FROM YOUR EASY CHAIR YOU CAN CONTROL THE FOLLOWING FUNCTIONS:

- **Channel Select up and down**
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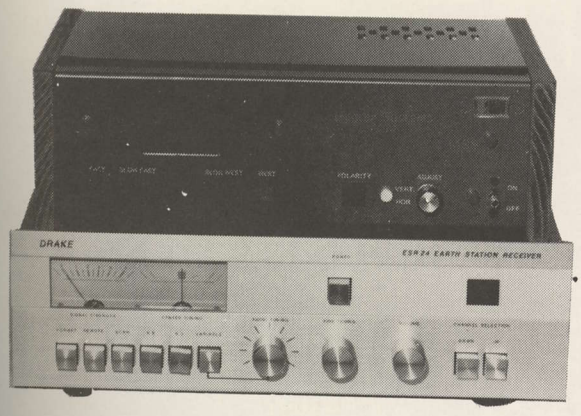
- **Audio Subcarrier up and down**
- **Volume up and down**
- **Volume Mute**
- **Satcom Westar Polarity Format**
- **System ON/OFF**

(Motor drive control available with MSS unit shown below)

Volume control can be reassigned to control polarity skew with optional Polarotor 1 circuit board.

OUR DELUXE CONVERSION SYSTEM
Infrared Control of the Motor Drive and Receiver



By connecting our MSS mount control to your Drake you obtain all the infrared control functions listed above, plus the added convenience of wireless motor drive control. This system offers all the control you need to change satellites, channels, and polarity from your easy chair.

Vector Systems offers a wide range of actuators from Saginaw and Burr engineering. All conversions come with easy to follow instructions and diagrams.

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SATTRON; Stillwater, OK; 405-377-3311
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QUARLES ELECTRIC; Greenwood, SC; 803-229-3638

*Drake is a trademark of R. L. Drake, Inc.

As a new entrant in the already overloaded antenna supply field, the ECI 11 footer is a good start towards optimized performance. In particular, the antenna should be appealing to those who have to make rooftop mounts, or those who have uncommon amounts of terrestrial interference in the area. In areas such as the northeast, where low look angles are often married to high terrestrial problems, the ECI 11 footer should be a very viable antenna.

Distribution. ECI currently has something of a distribution problem. The antenna was originally to be offered through a single, national distributor. It was the distributor who was packaging the antenna with the feed from Seavey. That may, or maynot, be the way it is as this appears in print. Regardless of how it is done, the antenna without a special .3 f/D feed is nothing special and therefore buyers are cautioned about buying the dish alone.

Packaging. While we were testing the antenna, we had a telephone call from a chap on Grand Cayman Island who had been advised that some testing was going on. He was hoping that the antenna would be the 'equivilent of a 16 footer'; something he had been **told** by a person **other than** Walter Grebis. We told him that was not the case. Shipping of the antenna **is something** that needs some additional work. Since you have 8 pre-assembled segments to the antenna, and they are in their portion of a parabolic curve, you can't simply ship the parts knocked down/**laid down 'flat'.** This means there is a sizeable container, although a light container, involved. It won't go UPS, and that puts it into the truck system. Air-freight, to foreign distinations, will be a 'cube' pricing situation since the size of the container will exceed the weight classification. When you add to this the intended South River mount, you may have a pretty substantial freight bill before you get all done. If you worry abour such things, you are advised to check on what the costs will be before you have the antenna shipped.

MOUNT is galvanized, hardware is 'stainless steel.' The time clock is running, barely 75 feet from the ocean beach.

ECI/ Engineered Communications, Inc. (7-B Jules Lane, New Brunswick, N.J. 08901; 201/828-5009) has an excellent performing 11 foot antenna system with one approach to getting the best of both worlds; antenna pattern, plus, antenna gain. It will be interesting to see if others also follow into the .3 f/D area, and just where this leads us as an industry towards better control of antenna sidelobes and ultimately, perhaps, fewer worries with close spaced birds or terrestrial interference.

PROVO MAY 21st

CONIFER's 12 FOOTER

MORE Than An Antenna

Hard on the heels of the ECI antenna tests over the weekend of May 14th came **George Jones** of the **Conifer Corporation** with their latest antenna; a 12 foot dish that arrives in a sizeable shipping carton. Inside the carton are 16 dish panels, a mount, various pieces of structural hardware, a 4 inch chunk of pipe and the motor drive mechanics.

What we did not realize when we initially talked with George concerning the antenna, in Las Vegas, was that Conifer has, like many others, adopted the 'package concept'; that is, they are now into the complete package that includes every nut and bolt, every piece of wire, even the Coax Seal you need to secure the installation against the weather. In other words, if you are a dealer, you can order the 12 foot **system** from Conifer and then sit back and wait for its arrival. There is no chasing around for cables, modulators, drives, or even an inclinometer (one comes with each antenna package!).

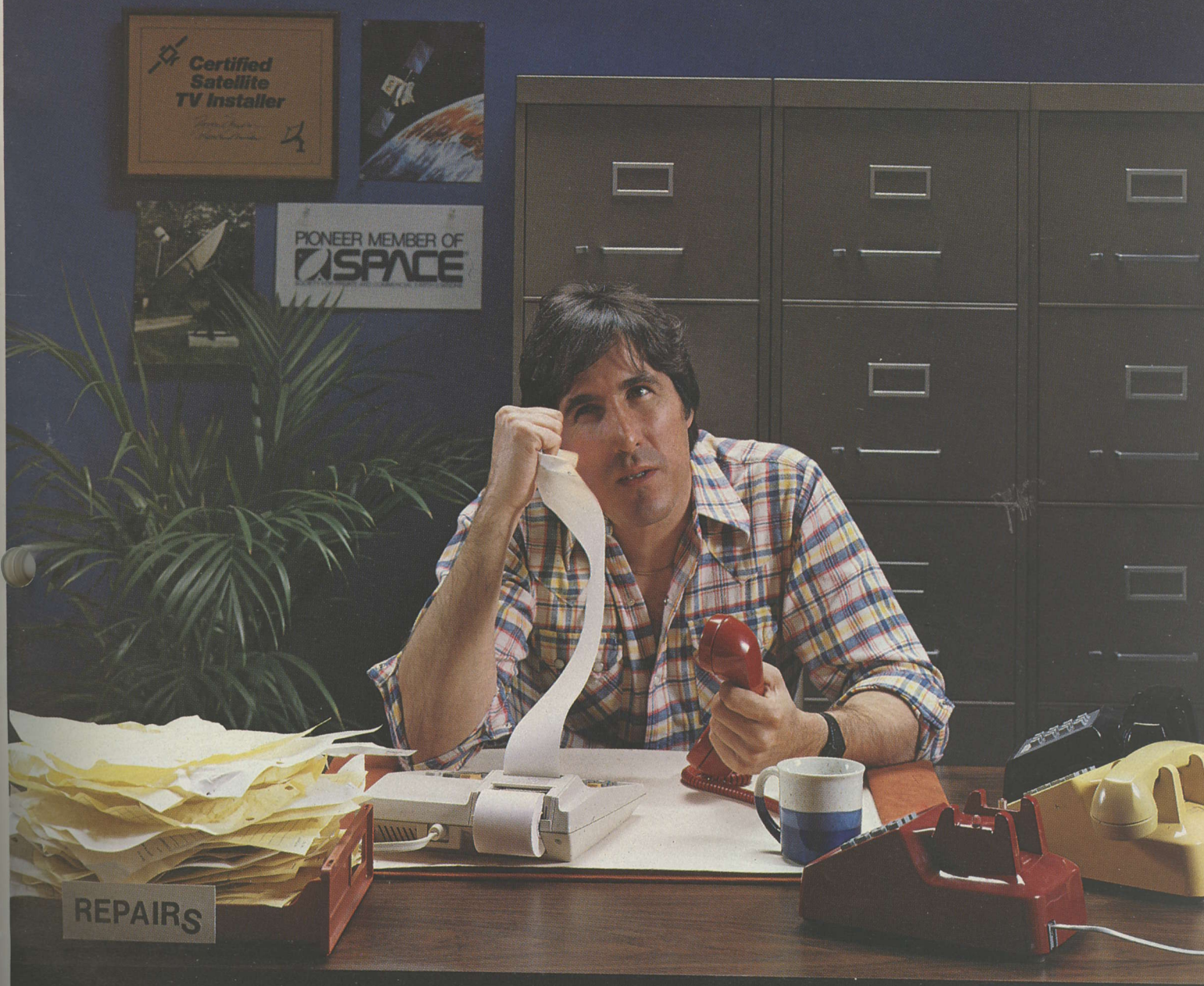
People have been packaging equipment, **at the distributor level,** for a year or more. However, other than the recently announced Intersat IQ-160 system (which includes everything but an LNA), this would appear to be the first time that so complete a dealer-ready system has been packaged. That's nice, but as we shall see, there are warnings here as well.

Jones is no stranger to the TVRO field. We first met George at a Chicago CES show back in the late spring of 1980. He was trying to get a new company off the ground at the time. He wanted to package a complete TVRO system, down to the last nut and bolt, and he wanted to back it up with a national marketing program. George was about a year too early, and it took National Microtech to finally get that type of industry distribution off the ground and running. In the interim he has been trying to sell others on his concept, and for the past two years or so he has been working with the Conifer people in Burlington, Iowa.

Conifer, other than being an advertiser in **CSD,** may not be familiar to everyone. A little background is in order. Conifer is a 'spin off' of Winegard. Everybody knows about Winegard; they are the people in Iowa who have been building home television and FM antennas, amplifiers and accessories for some 30 years or so. John Winegard first appeared on the front cover of a Coop publication in 1960; at the time he had just introduced the first all transistorized antenna mounted VHF signal booster that was married to a deep fringe TV (FM) antenna system. Conifer has close business ties to Winegard, and John's son

CONIFER/ continues page 57

Rather be selling than servicing? Call Dexcel.



Handling TVRO returns and service calls wastes time and eats profits. That's why Dexcel built the DXP-1100 to be the most dependable receiver system you can buy, with fewer than 3% returns.

And Dexcel backs it up, by offering you the **only** two-year warranty on the market.

DXP-1100 includes:

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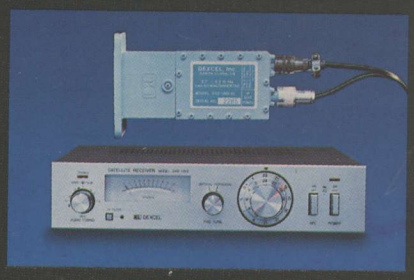
- Best value

Call today for the distributor nearest you. Gould Inc., Dexcel Division, 2285C Martin Ave., Santa Clara, CA 95050. TWX 910-338-0180. **Phone 408/727-9833, extension 37.**



GOULD
Electronics

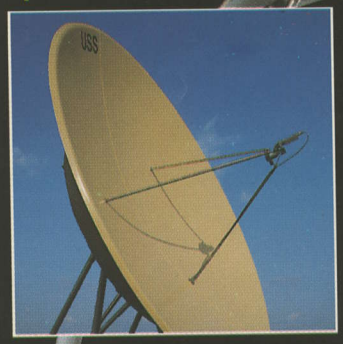
Track Through The New USS™ SR-1 System

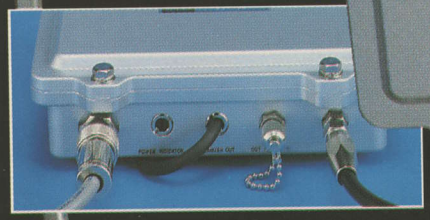
Better By Design

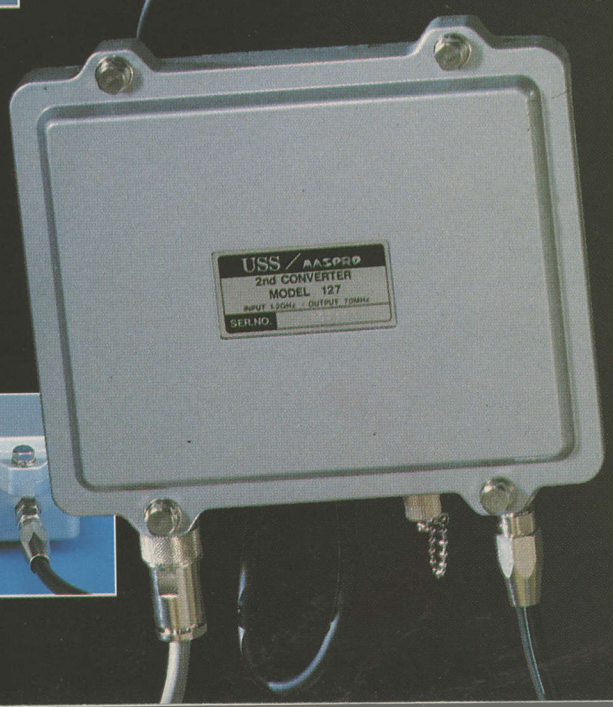
For years, dealers have searched for quality satellite television reception in an attractive package that's EASY to sell and install. Now, United Satellite Systems has the answer. It's a second-to-none, totally integrated electronics package that even includes a remote-control unit that can be used in any room in the house.

Track it through. See for yourself that USS has put it all together for superior quality earth-station viewing.

The USS Antenna is a commercial quality, prime-focus design parabolic reflector that was tested and proven superior at an independent microwave antenna test facility.



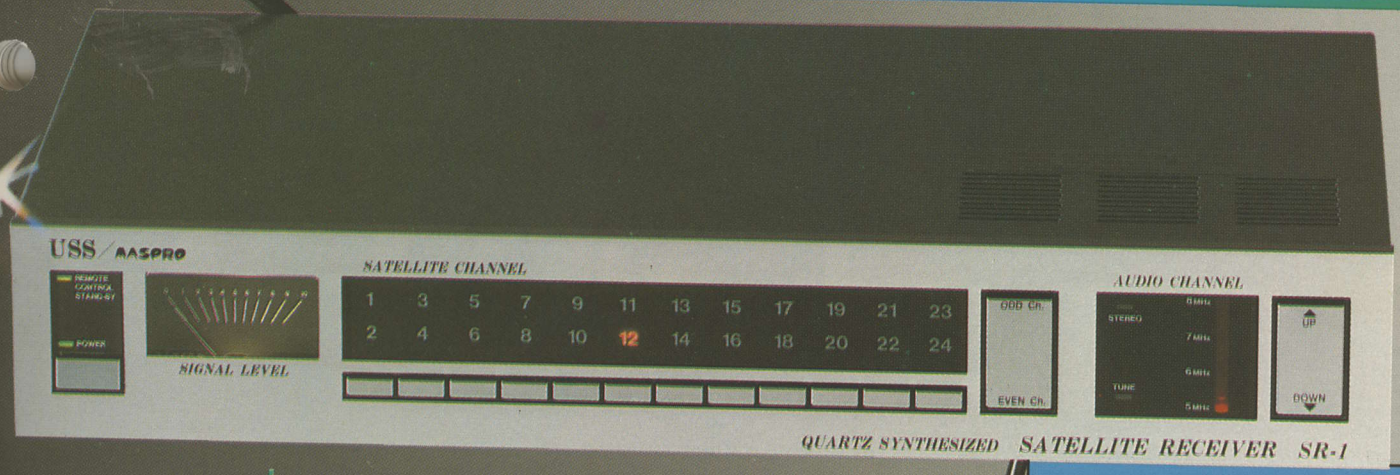




The USS LNC, using the latest GaAsFET technology, amplifies the signal, tunes the transponder, and down converts from 4 Ghz. to 1.2 Ghz.

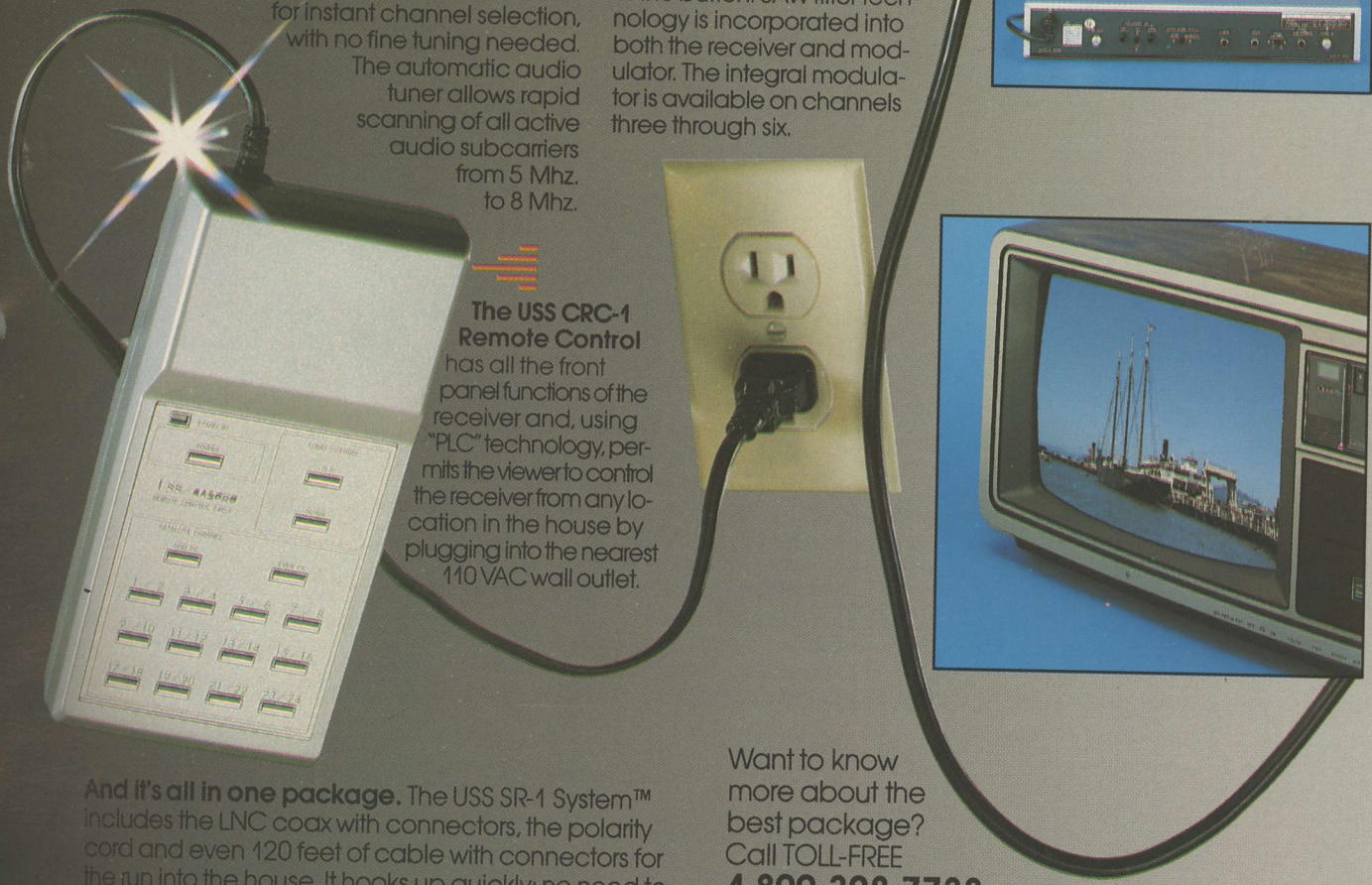
The USS SR-1 System™ interconnects with a single coaxial cable. For easy installation, we have multiplexed onto one coax cable the IF signal, tuning voltage, and three-wire polarity control, eliminating all excess wires.

The USS Second Down Converter converts the signal from 1.2 Ghz. to 70 Mhz. It contains the power supply, polarity interface, pilot light and antenna "peaking" test point. It's in a rugged die-cast aluminum, weather-proof, O-ring sealed housing.



The USS SR-1 Receiver has a soft-touch, push-button, quartz-synthesized encoder for instant channel selection, with no fine tuning needed. The automatic audio tuner allows rapid scanning of all active audio subcarriers from 5 Mhz. to 8 Mhz.

Automatic polarity switching is instantaneous with a push of the button. SAW filter technology is incorporated into both the receiver and modulator. The integral modulator is available on channels three through six.



The USS CRC-1 Remote Control has all the front panel functions of the receiver and, using "PLC" technology, permits the viewer to control the receiver from any location in the house by plugging into the nearest 110 VAC wall outlet.

And it's all in one package. The USS SR-1 System™ includes the LNC coax with connectors, the polarity cord and even 120 feet of cable with connectors for the run into the house. It hooks up quickly; no need to buy additional enclosures, extra wiring or weatherproofing. No special tools required. USS delivers easy installation and trouble-free performance for you...a user friendly system and high-quality reception for your customer...And it looks good too. A leading publication called it "the most elegantly finished receiver on the market."

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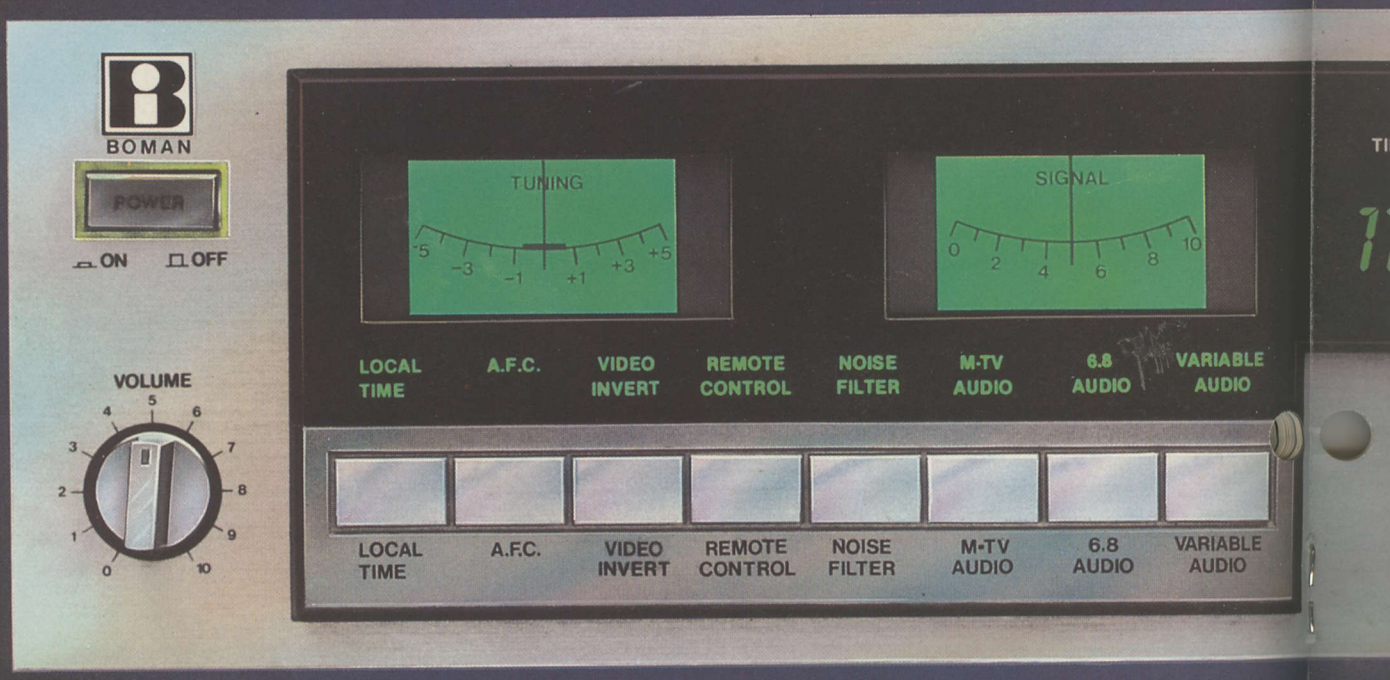

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- Feather-Touch M-TV Preset Audio Push Button
- Feather-Touch Time Display Button
- Feather-Touch Audio Preset Button Override
- Feather-Touch Dynamic Noise Reduction (DNR)
- Feather-Touch Video Invert Button
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- Feather-Touch Transponder "up" Search Button
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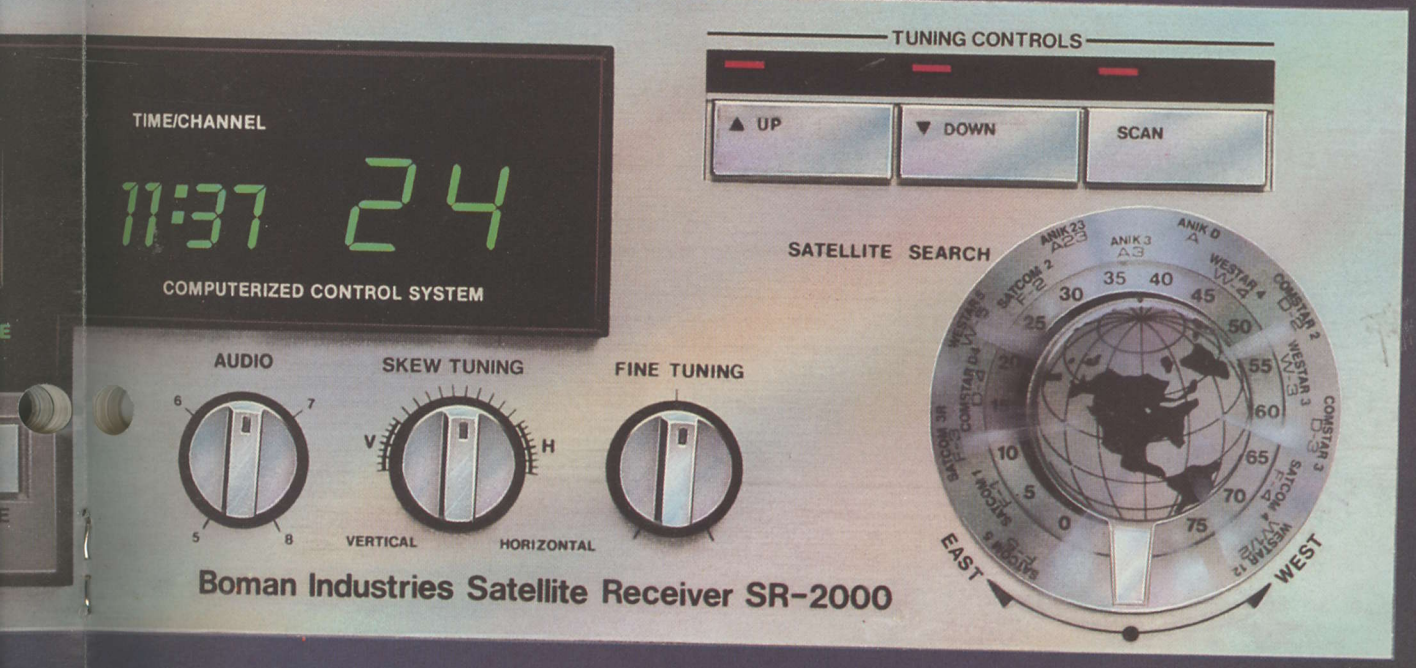

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- Video Fine Tuning Control
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- Sparkle Free Discriminator Circuit
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- Select up to 12 different satellites with our precision Satellite Search Control.
- The detent feature assures accurate selection every time.

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- The feature is specifically engineered to deliver optimum picture performance by permitting fine tuning of the antenna after satellite selection is made.

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Contemporary styling, state-of-the-art performance, down to earth pricing

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Here's the best news yet. The R-10 with Option M is one of the first modulator systems to be FCC certified in accord with the latest test regulations.

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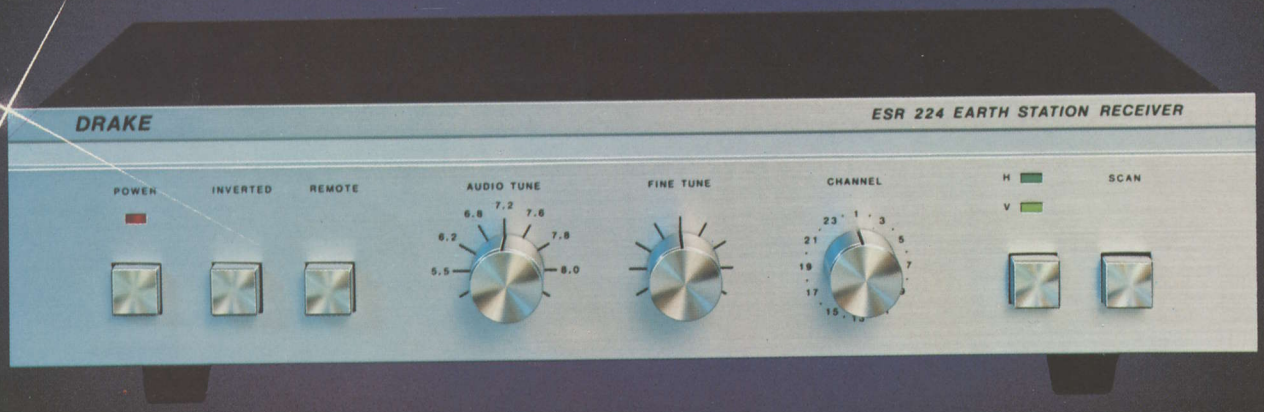
Use of this equipment, as part of a TVRO system may violate Section 605 of the Communications Act of 1934, as amended, through the unauthorized interception and divulgence of radio communications, or, the use of radio communications for one's own benefit where there is no entitlement to its receipt. The customer is responsible for compliance with all local, state and federal government laws and regulations including but not limited to construction, placement and use.

EARTH STATION RECEIVER



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- Detent Channel Tuning • Normal/Inverted Video Switching
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- Channel "Scan" Function • FCC Approved Modulator Available
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PIONEER MEMBER OF SPACE

CONIFER/ continued from page 48

Randy is the top man at Conifer. It may confuse some to learn this, but Winegard and Conifer **actually compete against one another** in many segments of the TV and FM marketplace. If that seems like a strange way to operate two closely related companies, well, you'll have to talk with Randy or John Winegard about that one.

Conifer is in the STV and MDS hardware business; they are also into some contract work in the microwave region. One assumes, although it has been more than a decade since we visited Burlington, that there is a decent technology base there.

What George Jones has brought to Conifer is an extremely keen sense of marketing. Because Jones tried to start his own national TVRO distribution business in 1980, and failed, he has about as much experience as anyone in this field to draw upon. George is the kind of guy who is quick to recognize what is good about a concept, and to profit when he finds out something is not so good. He doesn't stand on ceremony. There was no ceremony when he donned a pair of shorts and a T shirt and dug into the carton with our Turks and Caicos antenna assembly crew to get their 12 foot system operational.

We selected a site away from the traditional WIV locations. The present 'Grace Bay', or WIV studio complex location, is frankly, over-run with antennas. The Cooper house is nearby, and long term we'd like to keep the location as a 'home' and not allow it to become an out of control antenna test range. There are five operational dishes at that site now and that's it; we may change the composition of the five from time to time, but not the total number on site. When we opened the WIV 'Tower Plaza' broadcast centre (that's English for center!) last November, we started off with three antennas on site. That seemed like an adequate number to pull in the three off-satellite services we were planning to carry (from three different birds) on the then-planned four channels of over-the-air television. Well, there are now seven antennas at that site and two more on the way. We have been promised the opportunity to install and test a 7.7 meter antenna late this summer, and by leaving room for that monster, the 'Tower Plaza' site is now, also, full. Someone down recently remarked that it had all of the earmarks of a 'structured' (as in **reasonably** will planned) STTI trade show.

All of this is by way of explanation. We elected to 'stick' the Conifer 12 foot antenna at the private home of a local resident. That sounds like some hanky-panky so once again, since those who may be sending antennas down in the future will face the same situation, some explanation.

On Provo, we have an excellent medical clinic. The clinic is run by a group of doctors from the US who have their own 'thing' going. The clinic is staffed, full time, by one or two doctors. The doctors, and their families, come down for from two weeks to a month, stay in a nice home owned by the clinic, and dispense medical attention. Charges at the clinic, to white and black alike, are **very** low.

To keep this first rate medical facility operating, since the charges are low, the clinic has a constant, on-going fund drive. Local people, including the Coopers, donate items which can be 'auctioned off' to the highest bidders. All of the money from the auctioned off goods stays with the clinic. The clinic, by the way, is IRS tax exempt (a so-called 501-C3 corporation) so when you donate something, you can (if you so desire) subtract the cost of that donation from your U.S. income tax.

WITH 4 inch mounting pipe in concrete, the framework is assembled first.

AFTER the framework is in place, the screened panel sections are installed. You connect them together in pairs (eight sets of two) **and then install the eight pairs to the frame.**

What does this have to do with satelliteTV? I'm almost there.

We decided to donate the Conifer package to the 'clinic'; and they auctioned it off and raised a decent four figure number. I neglected to tell Conifer this in advance, but that won't stop them from taking the 'donation they made' off their 1983 corporate income tax if they so wish. The guy who was high bidder on this terminal system, by the way, is a retired corporate VP from Borg-Warner so it found a good home.

Many of the future systems sent down for evaluation are going to find an ultimate home in this manner. Again, we spell this out here so that those sending them can perhaps be persuaded that their system ends up doing some really nice things for humanity in the process of winding its way into these pages.

The morning of May 21st dawned bright and clear and Jones was ready to go to work. The spot selected was some 100 feet from the ocean, buried behind some local vegetation. The run into the house would be just under 150 feet and before we got down, we'd carry the control cables inside in some buried PVC. George assures us that the special cable (more on that later) will **probably** withstand direct burial, although he admits it is not so rated by Belden. We prefer to put everything in PVC down here since we have some very small, and very nasty little creatures called 'wire weevils' that love to chew up buried cables.

Conifer's mount is a reasonably well protected (from rust) 4 inch post. The post matches the rest of the antenna system, and although ours is white you have a choice of four decorator colors.

The mount and the pivot tube, plus the elevation jack, azimuth jack bracket and motorized jack all go onto the post. As you go along you are building a back 'frame' for the 16 panel sections. The 'hub' consists of a 16 inch disc and 8 ribs. When you get them into position, you have a frame onto which you will slide and bolt down the 16 screen mesh panels.

Before you begin installing the screen mesh panels, you pair them up 8 times, by bolting together 8 sets of two each. Now you have 8 master panel sections to slide into place and bolt down to the 16 inch disc and 8 ribs.

There has been a considerable amount of written material of late concerning the long term integrity of the finished dish product. In particular, there has been concern that by using dis-similar metals and by not selecting materials which will resist rust and corrosion, each antenna becomes a sort of 'time bomb', slowly clicking away into a collapsed state. We, therefore, pay particular attention to antenna parts and the way they are finished. Now almost everything looks great when it comes out of the factory box. Or at least it should. The

Conifer 12 foot system was no different; bright white, no rust, pristine and clean. But, the expanded-extruded screen mesh is attached directly to the aluminum frame or panel sections with some small fasteners. How long will they hold up?

Jones. **"We were very much concerned about this, even before** CSD **began drawing people's attention to the possible causes of antenna failure. I believe we have a process which will not allow the metals to rust or corrode. Thee is a very special coating, and we have a test report available for anyone who wants to see it, that covers the entire antenna surface. In particular, the fasteners that hold the screen mesh in place are double coated".**

Half joking, he would later remark "I hope we don't see this antenna on the front cover of **CSD** in two years, all rusted and falling apart!". Still later, he would again half-joke with local antenna installer Peter Stubbs "How about if I leave behind four gallons of paint, and every month or so you pop over here and touch it up . . . just in case."

Antenna degradation continues to be a particularily troublesome problem. At least **CSD** has the attention of manufacturers on this issue.

The individual panel sections, all 16 of them, weigh in at just about 4.5 pounds each. Two, bolted together, are still under ten pounds with hardware. The hardware sent down did not happen to be stainless. We chided Jones about that, and he promised to send us down a stainless steel kit when he returned to Burlington. Of course substituting stainless hardware over the full antenna would require pulling the full antenna apart, and starting all over again. At Conifer the stainless steel 'option' is but a paltry $35, and anyone involved in installing such an antenna within 25 miles of a seacoast, in a particularily damp climate, or within the 'overflow' of an industrial city such as Pittsburg would be well advised to **start off with** stainless hardware.

The 8 panel-pairs go onto the back frame in about 45 minutes time with two people working on it. We had four, and they kept stumbling over each other. We found the panels to fit or align to the holes on the back frame with no particular problems, but in complete frankness the antenna does not have the 'precision engineering' and super-tight tolerances which characterized the previously-reviewed ECI 11 footer. The real proof would be the performance, and that was ahead.

The feed supports on a figure 7 or button hook offset support that comes out of the center of the dish. There are three sets of 'guys' to anchor the feed firmly in place. We'll talk about them shortly.

CSD apparently received an early production model of the system. Jones pointed out that in the units now being shipped, the polarization rotation control wires and the RG-213 cable that connects the LNA to the down converter feed back to the down converter **through** the support pipe of the feed. Somebody forgot to allow sufficient room on the inner diameter of the support pipe for the bulky type N connector to slide through the support tube on our antenna, so we taped the pair of wires back down the feed support on the outside. Not a big deal, and it

FIGURE 7, or 'button hook' as some call it, feed support system is pre-engineered for proper focal distance. Coaxial cable, polarization control wires go down inside of feed support (rather than on outside) **on** current **production models.**

shows that Conifer is still learning about their product.

The feed is anchored to the 16 inch metal disc in the center of the antenna in such a way that the installer has no real adjustments to make; at least not 'in' and 'out' for focal length. The theory here is that the dish cannot be assembled improperly, so therefore the dish's depth will always be exactly as designed. If this is true, then the focal point will, also, always be precisely where the factory calculated it should be and they will back this up by supplying a non-adjustable feed and LNA support system.

What you do have to play with are the three guys that tie the feed to the outer perimeter of the dish. Since you are approximately 5 feet (56") in front of the center of the dish with the working end of the feed mast assembly, **there is some 'leverage' there.** When the dish is at relatively low look angles (F3R here is under 20 degrees), the weight of the LNA plus the feed is such that there certainly can be a slight 'droop' of the end of the feed, towards the ground. Keeping the center of the feed aligned with the center of the dish is always a challenge at low look angles with feeds of this sort. Most firms that have this problem prefer to 'guy off' the feed end of the assembly, back to the dish perimeter. Conifer is no exception. We'll return to this shortly.

The downconverter installs in its own 'splashproof housing'; a metal container that straps to the 4 inch support pipe at the rear of the antenna. Into the downconverter plug the 213 cable carrying the LNA signal (and sending power to the LNA), and the Polarotor (I) three wire control cable. Now here is where Conifer has done a clever and much needed thing.

They supply a cable harness that plugs you into the master interconnection wiring inside of the splash proof housing. The harness is designed for two purposes; to get you into the master cable that will carry you to the receiver location inside, and, also allow you to **move the receiver** proper **to the dish itself,** and simply 'plug in' so that you have all of the system controls and tuning knobs right there at the dish for initial alignment; or, later test.

If you have ever fought with making up special cables or wondered how in the world you were going to come back later and 'test a dish', at the dish, **after** you had the receiver inside and the control cables run inside, this is the answer. In other fields, they call this **'break-out cabling'** which simply means that you really have two places that the receiver can be connected even after the installation is completed; inside, where normal viewing takes place, and outside, at the dish, if there is a need for being at the dish for tests.

Plugged into the break-out cable and doing the initial system set up, we received a visitor; former SPACE President Tom Humphries ambled by to see what the performance was. Since we had just completed initial, rough, F4 to F3R tracking adjustments there were the usual (and appropriate) "ooohs" and "ahhhs" as Humphries walked up.

"The feed is off center" he suggested. Jones wondered how that could be. "You can see it" pointed out Humphries, "look here". Well, a Tom Humphries might see it but George Jones did not. **"Let's put a tape on it"** suggested Humphries. They did, and sure enough, across a 12 foot surface there was a 3/8th inch error. Jones scratched his head, since the only way to adjust the feed position was to tighten on one front turnbuckle and loosen up another. None had been placed on

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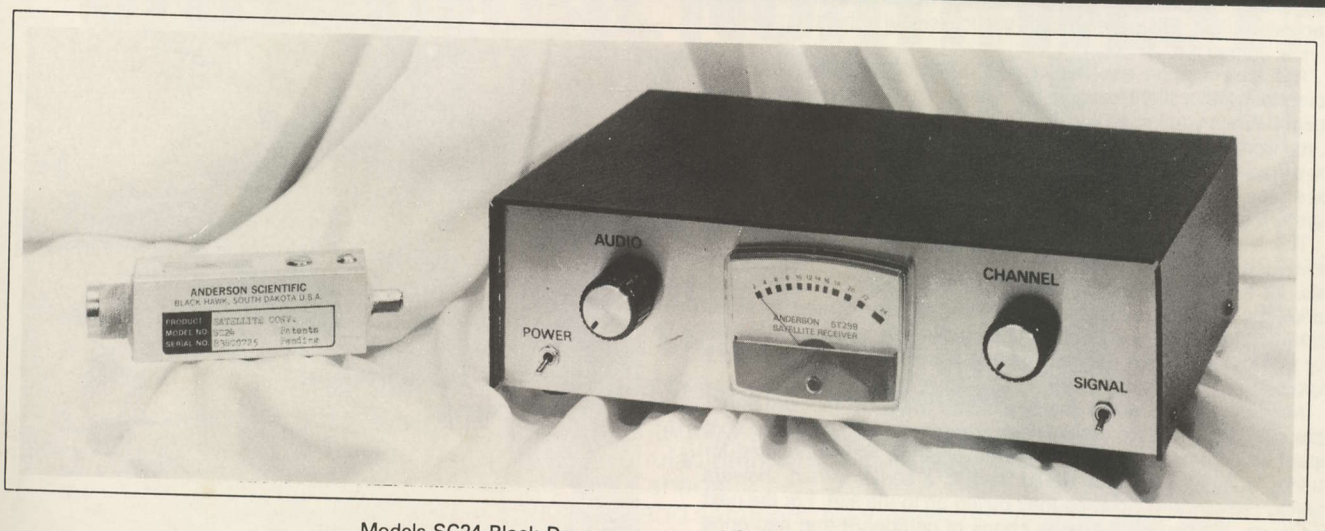

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the dish at that point, and the 'off' direction had nothing to do with feed "droop".

Thirty minutes later, after putting on, tightening up, backing off, and then taking off the guys, it was clear that adding the front guys and using the turnbuckles was not the answer. You could center the feed, precisely, alright. But in the process you lost signal rather then gaining it. How come?

The feed support assembly/mast had been released from the factory with just a slight 'cant' to it. In other words, it was not precisely straight. When you forced it to be straight with the guys and turnbuckle, you were actually only forcing the end of it to **center.** In the process, you were also twisting the direction which the Scalar feed pointed, and you ended up with the front of the Scalar no longer totally parallel, and therefore looking directly towards, the center of the dish surface.

The best field solution to this problem, on a sand dune in the middle of the Caribbean, seemed to be to take the figure 7 feed off the dish, try to measure and locate where the welding had deviated sufficiently to cause this slight problem, and then try to force the piece back into a 'plub line' with a couple of car jacks. We talked about it for a few minutes and then decided getting a cold beer seemed more important so we called it a day.

Although we had **good** quality pictures when we knocked off for Saturday, Jones felt we could tweek some more and do better so a repeat visit to the sand dune installed antenna was scheduled for Sunday afternoon. As luck would have it, a series of rain showers greeted George and Coop as they pulled up to the site. For the next two hours, hiding under a large chunk of cardboard that had once been a shipping container for a 12 foot dish, the dish was checked, adjusted for tracking, and checked again (and again). The slightly off-center-pointing feed problem was ignored since the dawn of a new day produced more rationale thoughts about the wisdom of trying to correct a 3/8" error at the end of a 57 inch piece of pipe with two car jacks.

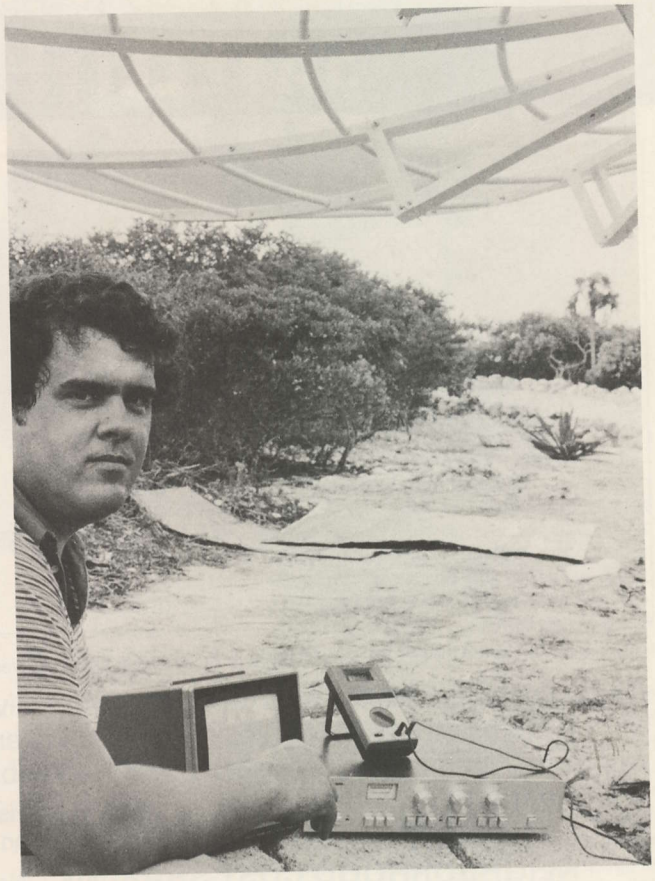
The Conifer receiver package is an unusual one. It has just enough bells and whistles to move it into the big leagues, but not nearly so many as say the IQ-160 from Intersat. Jones on bells and whistles. **"We will have three different models when the line is complete; one that is low end priced, this one in the middle, and another one with infra-red control and all of the gadgets."**

This one has enough gadgets for most people.

1) The motorized jack screw drive is operated by a control on the front panel of the receiver. The control is calibrated with numbers and it will, after antenna set-up, have a number that corresponds to each satellite location. For example, 10 might be F3R while 45 might be W4. To change satellites you turn the knob from where you are to where you want to be. That starts the dish moving and when it arrives at the newly dialed-in number, the dish movement stops.
2) There are a pair of 'pre-set' push buttons that function with this. Using a set once and forget pot on the rear of the receiver, you match up say F3R on one of the two front panel buttons, and perhaps F4 on the other button. Now, to select either of **those two satellites,** you simply push the appropriate button and off goes the dish to the pre-set position. For the balance, you use the main dish movement control.

The two pre-sets are potentiometer set. Pots. The unit set up just fine and seemed to work flawlessly whenever you wanted to go back to the pre-set positions. **However,** pots have a way of being troublesome when there are power glitches, or when you are in a moist climate. We'll have to re-visit this from time to time to see how they hold up in the real world.

The single knob control that selects all of the satellite positions does not have a companion digital or other fancy electronic readout. You read the satellite's position off the calibration marks silk screened around the knob's rotation center. We found the mechanical 'fine tuning' of that control very sensitive. You can always put the dish at a stop position that corresponds to the maximum indicated signal strength on the meter, or the best looking picture. **But,** you have to take some care with man handling the knob since just a slight click-click advancement of the knob results in a sizeable movement out at the dish. A two-speed control, one that moves the dish fast for big moves, and one that moves the dish a 1/10th speed or so for fine tuning, might not be a bad idea for the little old lady in Dubuque with arthritic fingers.



DODGING rain showers, Jones spent an extra hour on March 22nd by himself playing with the dish. "I can't get over how strong **some** of the signals are down here" **he noted.**

The audio has a pre-set 6.2 and a pre-set 6.8 pair of push buttons, plus a fully tuneable audio sub-carrier control. Everything works fine here, but as George found out there are really some situations where it is **nice** to have both 'wide band' audio and 'narrow band' audio (such as found on the AVCOM COM2, for example). You will have some difficulty properly tuning in the 'narrow-band-FM' sub-carriers on WGN's transponder 3 of F3R, for example, with the wide-only audio recovery bandwidth provided.

The RC-2001 receiver/downconverter package has an auxiliary button on the front panel. This is an 'expansion' switch that allows the user to do addition switching of whatever he might wish. In our case, we wanted to be able to switch the AFC on and off; so we could force the receiver to stay where the tuning knob was set, and not allow the receiver's automatic frequency control circuits to drag us unwillingly to an adjacent transponder, for example. This is how our switch was wired.

On the back of the receiver are a pair of pots that allow you to tweek on the Polarotor I 'pre-set' positions. As most readers realize, 'vertical' is never really vertical and 'horizontal' is never really horizontal, **unless** the satellite is **absolutely due south** of you. This means that as you track across the sky you have a slight change in the apparent position of both vertical and horizontal signals, as they arrive at your antenna. The polarization change fron F3R to F4, for somebody in the Caribbean or southeastern USA, is on the order of 20 degrees. That's enough so that if you set the 'vertical' or 'horizontal' alignment on one end (F3R) or the other (F4), by the time you get the dish to the opposite end from the end where you set it up, you will no longer have proper 'cross pole isolation' (i.e. you'll see some horizontal signal in the vertical position, and vice versa).

Since the approach of the RC-2001 is to make the system as automatic as possible, the intent of these pots is to allow the dealer to

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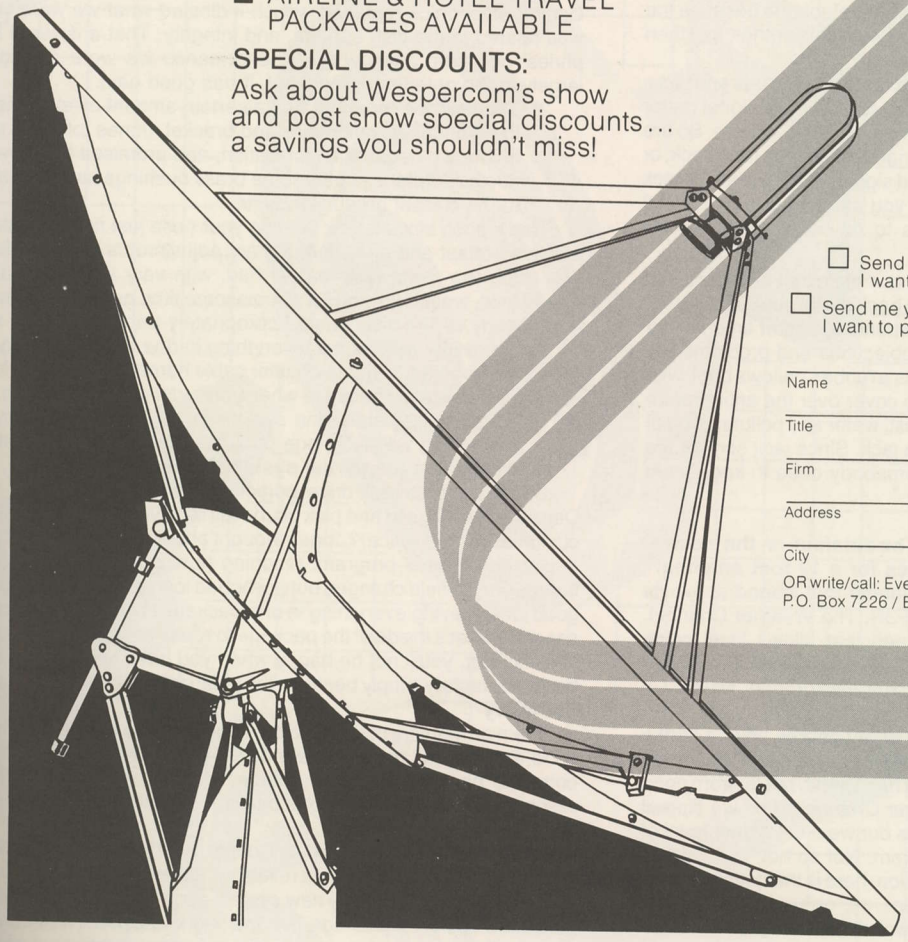

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do proper 'polarization alignment' at the time of installation, and then the customer never has to worry about such things. He simply hits vertical ('V') or horizontal ('H') on the front of his receiver and tunes in the service he wishes.

In the real world, as opposed to the engineering lab where this concept was created, you have little nuances to contend with. For example, when you are far to the east of the active orbit belt, as the Caribbean and Florida are, and you have a highly desireable satellite such as F3R at the very end of the belt from you, you don't really want to 'compromise' the vertical/horizontal polarity settings of the system in the middle (such as on W4). If you elect to do this in the mid west, or on the west coast, no problem. The signals are strong, and more important, the birds are pretty well spaced across the sky for you so the tracking stays quite true. Not so when everything is west of you.

We elected to set the controls up on W4 initially, aware of course of what the potential problem would be. Then we checked F4 and F3R, at the opposite ends. Sure enough, there was some cross pole 'crud' on both sides, but in particular on F3R where you have such diverse signal levels adjacent to one another. TR6 (WTBS), for example, is weak down here. TR7 (ESPN) is very strong. If your polarization skew is slightly off, and you are on horizontal and trying to watch WTBS, you'll get some ESPN 'bleed through' which shows up as additional degradation on top of the already noisy WTBS signal. Not good.

We pointed this out to Jones.

"It looks like we need to put a fine tuning control, on the front panel where the user can fine adjust the polarization" George suggested. We further suggested that the control have a push button that activated the fine tuning, and a pull out position which automatically returned the polarization skew to the pre-set location. **"In that way, then, they could always return to the dealer pre-set polarization position?".** That's it, George. If you simply gave the customer 20 degrees of play on the front, he'd forget all about it from day to day and the poor dealer would get 'trouble calls' on his telephone because the guy forgot and left it skewed all the way one way, or the other, and then went to the opposite end of the orbit belt.

The receiver has a wide range of user controls and plugs and jacks on the rear apron. The IF gain (which also changes the signal meter sensitivity) is there; RF output on VHF channels 3 or 4 is there. So are audio and video putputs to drive an external modulator, a tape deck, or a big screen projection set with baseband signals. There is also a jack to plug in an external tuning meter, so you can use one of the $50 Radio Shack three or four digit VOMs to do some really precise tweeking on the dish.

It was refreshing to see a package so complete that even a plastic tuning tool to allow the installer to set the back panel pots is included! In fact, Jones is to be congratulated to spending lots of time talking with dealers and finding out what their objections and problems are with existing 'packages'. It shows. There is a rubber 'bellows boot' with stainless steel clamps that allows you to cover over the entire motor driven screw jack. This will keep sand, dust, water and pollutants off of the screw jack and out of the guts of the jack. Since jack screws are known for their failure rate, anything somebody does to keep them running longer has to be a good step.

Performance

Humphries said it first. **"What is it? The antenna,** or, **the electronics? Those are awfully good pictures for a 12 foot antenna!"** After the initial tweeking, the first transponder that leaped above its normal noise level on us was TR21 of F3R; The Weather Channel. When TWC goes to that flat blue screen that allows local cable systems to insert their own local announcements, you can always see some white or black 'flecks' on the flat blue background. Noise.

Not on the Conifer system.

The electronics we put into use was a 100 degree LNA; a Drake 100 degree LNA. The data sheet showed it was between 92 and 87 degrees with the usual dip in the center. That's good, but far from good enough to account for the clean Weather Channel. Next we flipped over to WTBS on the horizontal side. It is our weakest carrier level of all of the F3R signals down here. Hummm. Not so hot.

After the final two hour tweeking session, here is the bottom line for this particular Conifer 12 foot installation.

1) **The system works** right in there with the Paraclipse. On **some** transponders, on **some** birds, it is a superior system. On **other** transponders, on some birds, it is an equal system. And, on yet other transponders, it is not up to the Paraclipse. This biggest anamoly we saw was that the vertical signals on F3R were in the 'better than' class, while the horizontals were in the 'worse than' class.

Yes, we wondered about both the slightly off-centered feed, and, we wondered about the integrity of the Polarotor I. We've had a couple of Polarotor I products down here in recent months which had a 'polarization isolation' anamoly; one that always cleared itself up when we changed out the Polarotor units. We tried that with this system and found no change.

Because this is a system, you have a more difficult time doing a standard Provo test range **cross check.** We did go back subsequently and remove all of the Conifer supplied electronics and subsitute our own reference set of electronics. The same patterns we saw with the Conifer electronics repeated, which indicated what we were seeing was related to the dish surface, and integrity. That answered Humphries' question, anyhow. The performance we were seeing was largely in the antenna. Simply put, it has good gain.

2) **The unit we received** had a certain amount of 'sloppiness in the manual elevation jack and bracket. Jones told us it would before we began the installation, and promised that new production tolerances plus some brass bushings had been added to the current production units.

That's good since it took holding your nose just right to make the elevation offset and elevation primary adjustments properly. Someone using the same antenna we had, with very little prior satellite experience, would have had a troublesome time getting the elevation set properly so the dish would appropriately track across the arc.

3) **As really neat** as the 'everything in one box' and 'everything tied together with one master cable harness' concept is for the dealer (simply because when you order a Conifer system, you can forget all about the system and its parts until it arrives; everything will be in one box), we wonder what will happen when there are **partial system failures.**

Suppose the motor drive portion electronics board goes bad? Does the dealer go in and pick up the full receiver (thereby putting the customer out of service)? Jones thought about this and decided that a dealer educational program, teaching how individual inside-of-box boards can be field changed out (swapped for new boards), might be a good idea. Having everything in one package is good **only if** you can separate what's inside of the package to repair an **individual** function. Lacking that, you'll not be happy when you have to return the entire box to the factory simply because the polarization rotation portion quit.

Summary

From an industry that forced the dealer to go to a dozen sources or so to round up all of the parts required to make an installation, to a complete package from one source, with one manufacturer totally responsible for every part of that package, is a heap of growing up in a few short years.

If the manufacturers, such as Confier, who follow this path can get a decent handle on equipment reliability; if they can cure the bugs that are bound to creep into any new system early enough that the dealers who want to see a package like this work and work well don't get turned off the concept, before it proves itself . . . well, it's a possible major contender for dealer attention.

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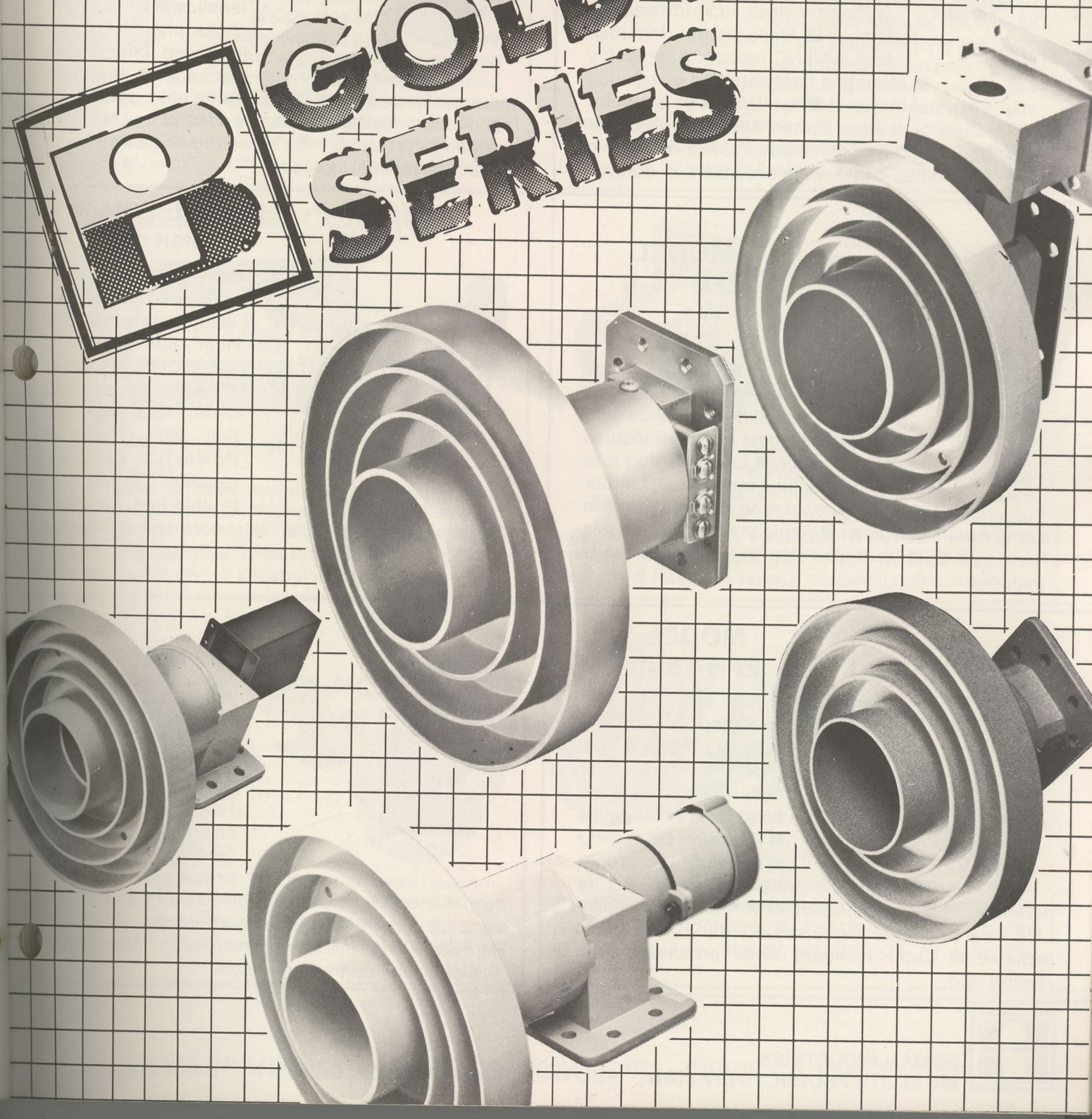

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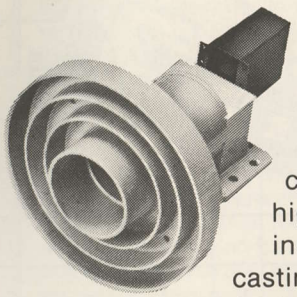

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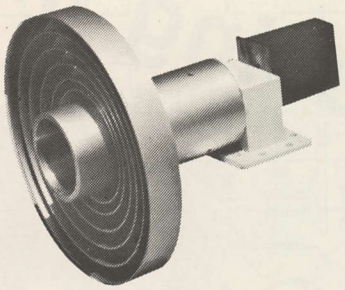
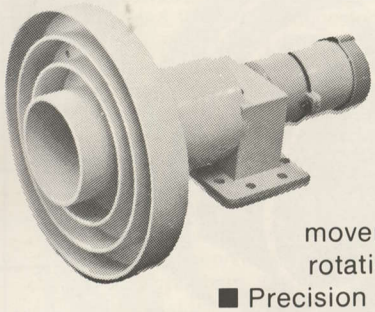
(HIGH—GAIN)



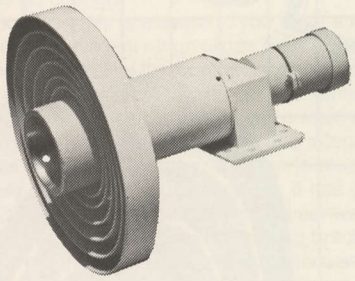
■ Offers superior performance over standard feeds on any "deep" dish ■ Precision machined waveguide for High Gain characteristics ■ Descending choke plate design for improved interference blockage ■ Precision servo motor operation ■ Epoxy painted casting for high weather resistance ■ Angle adaptor for LNA/LNC mounting versatility ■ Mounting hardware and instruction manual included



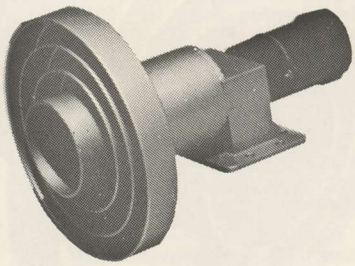
MODEL EFH-75-II

■ Full 360° probe movement eliminates need for rotational alignment of casting ■ Precision die cast feedhorn insures high performance ■ Low insertion loss ■ Powerful weather-resistant DC motor for trouble-free operation ■ Epoxy painted casting resists corrosion ■ Angle bracket for versatile LNA mounting ■ Illustrated step-by-step instructions included

MODEL EFH-75 II
(HIGH GAIN)

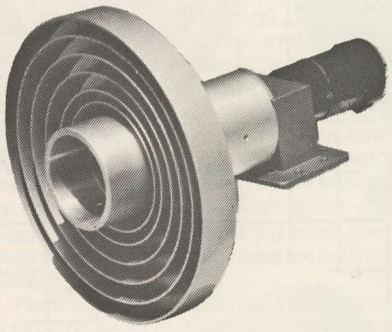


■Designed for exceptional performance on "deep" curve dishes ■ High gain waveguide and choke plate for reduced interference and better picture quality ■ Full 360° rotation ■ Powerful weather-resistant DC motor for trouble-free operation ■ Epoxy painted surfaces resist corrosion ■ Versatile LNA angle mounting bracket included ■ Illustrated instruction blooket included



MODEL EFH-75-III

■ High speed solenoid operation for instant polarity change ■ Low loss characteristics ■ Fully sealed for exceptional weather resistance ■ Precision die casting and strict Q.C. procedures insure maximum performance ■ Angle adaptor for vertical or right angle LNA mounting ■ Hardware and mounting instructions included ■ Cable included when purchased with control unit.



MODEL EFH-75-III
(HIGH GAIN)

■ Solenoid operated for instant polarity change ■ High-Gain feedhorn design improves performance on deep dishes ■ Precision-machined waveguide for outstanding results. ■ LNA angle adaptor included ■ Hardware and mounting instructions included ■ Available with control and cable

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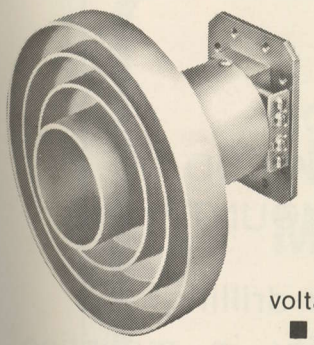
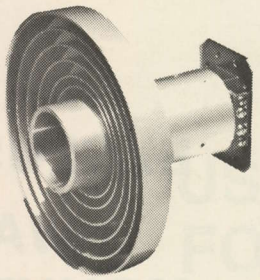


MODEL EFH-90
POLARIZER

■ Minimal insertion loss for outstanding picture quality ■ INSTANT polarity selection ■ Full 180° rotation ■ Operates with standard DC voltage supplied by most receivers ■ Adjustable casting for easy and exact alignment ■ Polarizer plated for superior environmental resistance ■ Small size allows installation versatility ■ Includes all necessary mounting hardware and installation instructions ■ Available with attractive control and cable

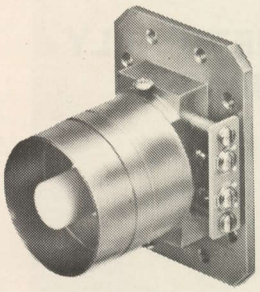


MODEL EFH-90
(HIGH GAIN)

High-gain design for "deep" dish applications ■ Totally solid state -- NO MOVING PARTS ■ INSTANT polarity selection ■ Advance choke plate design for reduced interference ■ Minimal insertion loss ■ High gain precision-machined waveguide ■ Full 180° rotation ■ Polarizer plated for high weather resistance ■ Adjustable casting ■ Mounting hardware and instructions included ■ Available with control and cable

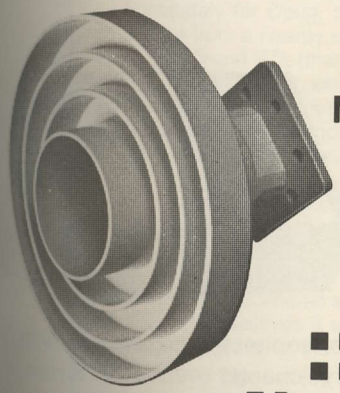
MODEL EFH-90 CONTROL

■ Handsome remote control unit for use with EFH-90 and EFH-90-HG features:
■On/Off switch ■ Skew adjustment control for peak performance on all satellites ■Vertical/Horizontal switch for instantaneous polarity selection ■ LED power indicator ■ 130 ft. of cable included when ordered with EFH-90 or EFH-90-HG ■ Operates on 110 VAC



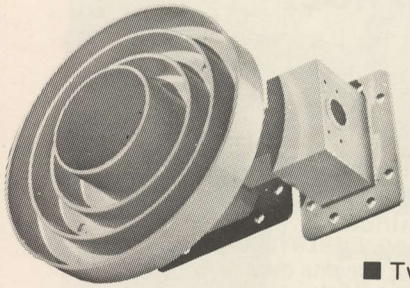
MODEL EFH-90-PO
(POLARIZER UNIT)

■ Mounts to standard and HG-type feedhorns ■ Precision casting and workmanship ■ Ferrite design eliminates moving parts ■ Minimal insertion loss when mated to Boman feedhorns ■ Screw-terminal strip for fast and easy connection ■ Full 180° rotation ■ Operates with standard DC voltage supplied by most receivers ■ Plated for superior corrosion resistance



MODEL MWF-65 Feedhorn

■ High performance feedhorn ■ Precision aluminum casting ■ Epoxy painted surfaces for super weather resistance ■ All hardware and instructions included



MODEL OMF-70
Ortho-Mode feed

■ Two mounting flanges for dual LNA applications ■ Perfect for commercial installations ■ Eliminates need for mechanical polarity change ■ Precise 90° offset for optimum performance on vertical and horizontal transponders ■ Epoxy painted aluminum castings for high weather resistance ■ All mounting hardware included

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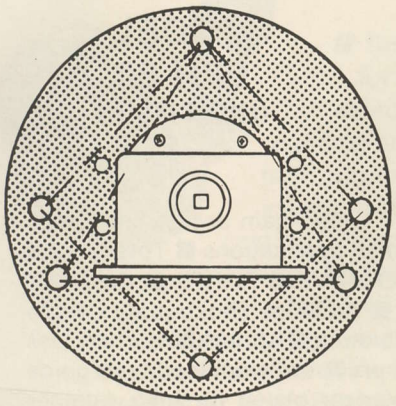

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■ For use with servo motor feedhorns ■ On - Off power switch ■ LED power indicator ■ Pushbutton for precise 90° polarity change ■ Skew compensation control for peak picture on all satellites ■ Provision for connection to receivers with automatic odd-even polarity change output ■ Stylish, compact body ■ Operates on 110 VAC

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USS's 12 FOOTER

A REAL 12 Footer!

Doug Dehnert's **United Satellite Systems** (Rt. 1, St. Hilaire, Mn. 56754; 218/681-5616) is one of the old line, established firms supplying small aperture TVRO antennas from the far northern portion of Minnesota. Doug got into the design and manufacture of TVRO fiberglass antenna because he, like so many of the early pioneers, wanted to watch television. St. Hilaire is so located that perhaps there is a single channel of off-air reception, a percentage of the time.

Dehnert's background is primarily mechanical; he spent approximately a decade with a Minnesota firm called 'Arctic Enterprises' which was very big in the manufacture of outdoor motorized sporting equipment, such as snow mobiles and water bikes. During his tenure with Arctic Dehnert found himself acting as primary liaison executive with the many off-shore (Japanese) suppliers for Arctic, and he recounts that during that decade he spent as much as 200 plus days per year in Japan tending to those liaison duties.

Many of the Arctic pieces used fiberglass in their manufacture. This served as a 'school' for Dehnert since some of those fiberglass pieces were treated to very difficult environments; the front 'ski' portion of a water bike, for example, or the body of a snow mobile, get a real pounding from mother nature.

Doug and wife Polly remember their first satellite dish; a 12 foot affair which they built from scratch during the winter of 1979 and 80. Minnesota winters are long, and the complete fabrication from scratch of a TVRO dish became their project for that winter. Polly recalls that she was sure that Doug was 'off the deep end on this project'; she could see no real good coming from the tens of pounds of fiberglass shavings, filings and 'itchy powder' which both would attempt to cleanse from their bodies after spending several hours scraping, sanding, and hacking away at their first dish.

Fortunately for Doug, the first antenna worked and with some assistance from a nearby cable operator he found himself watching HBO, WTCG and PTL (that's about all there was on the bird in those days!) one March night, while the antenna was propped up against a tree in a bed of snow. Polly remembers "Our cables were too short and we had to leave the downconversion part of the ICM receiver out by the dish. Then the downconverter to receiver cable was also too short so we had to go outside and reach inside a bag to change transponders. The first thing we did the next week was stretch the cable so that we could at least change the channels from inside"!

USS has not been a steady supporter of the industry trade shows. Nor have they been a well promoted company with plenty of trade advertising and brochures and slick handouts. All of that is changing since Dehnert believes it is time for the industry to become more aware of the quality of their products and the value offered.

The 12′ (6″) **Model 380** terminal came down to Provo on a freight plane. Dehnert trucked the terminal to Fort Lauderdale and without benefit of crating managed to sweet talk the air freight company into hauling the two half-pieces of fiberlass dish strapped inside the airplane, unprotected. He scared them to death about marring it; when the plane arrived on Provo the nervous freight agent asked us to 'hurry up and get this $10,000 antenna off the plane before something happens to it.' Dehnert knew how to get the man's attention; he placed

UNITED SATELLITE SYSTEMS' Doug Dehnert and 12 foot fiberglass dish at the Provo antenna range.

a 'value' on the shipment which was far above the real value.

The Model 380 antenna system consists of a very stout galvanized steel frame (tripod or three point mount , a galvanized polar axis 'tube,' two 'half sections' of fiberglass dish, a tripod mount for the feed plus the Polarotor feed,and a Dehnert created motor drive and controller system. Total weight is nearly 1200 pounds. The heaviest pieces, the two half-sections of the dish proper, are light enough that two reasonably strong people can lift them up and carry them around.

Dehnert tells a long string of stories reflecting on where his anten-

USS/continues page 68

na systems have been installed in 'untypical' places through the years. This model, or others (he has then up to 16 feet in size, down to 8 feet and is working on a 25 footer!), have gone to India, Europe, the Caribbean and elsewhere not in the vocabulary of the typical St. Hilaire resident. One particularly memorable installation, for Dehnert, went on the top of a small 12 foot by 12 foot elevator shaft, sitting on top of a 14 story building in downtown New York City. Naturally the elevator shaft was at the very edge of the building and he tells of hanging out over the street, 15 floors below, to attach and adjust the feed, on a makeshift set of 2x4's. Some people will do anything to get television.

Everything about the Model 380 is 'stout.' The dish, the feed support system, the mount are all top quality. In an industry where slight breezes cause other dishes to 'swing and sway,' or drive the feed into an 'oscillatory pattern,' the USS 12 footer sits there just as rock stable as any commercial grade system offered by any of the big name manufacturers. In fact, according to Dehnert, there has been a brisk business for USS from cable firms, Reuters' terminal users, SMATV systems and others who are often very quality conscious before they are dollar conscious. Dehnert loves to tell you "It only costs a little more to 'do it right'." In this case, 'doing it right' involves making everything far stronger, far stouter, and far more rigid than perhaps it needs to be for normal home use.

Does that rule out the system for home use? Quite the contrary, according to Dehnert. "We have an excellent group of loyal distributors who have been handling our product for several years. Some, as far away as California, must really like the product since the motor freight there is as much as 25% of the terminal cost alone."

There is of course some logic to what he says. Dehnert may not be into offering ten year, unlimited warranties for his terminals yet, but there is certainly a sound argument for selecting a system that you feel relatively sure will hold up for ten years or more, without degraded performance, when you are out there selling top quality packages. Dehnert admits to liking the counter logic which suggest that other 10-13 foot size antenna ship in far smaller packages, and perhaps cost less for transportation. **"I wish there was some clever way I could figure to knock down a mesh type antenna for ease of transportation, but still be sure that when it went together it would be stable, sturdy, and hold up for say ten years. Or, even five"!** It is Dehnert's view that if you are building a single model of an antenna, in one or more dish sizes, you have to assume that the dish will be used in some pretty hostile environments. "If we could all sell and install dishes in say the central and lower mid-west, or Arizona, life would be far simpler. Unfortunately, many of ours end up buried in ten feet of snow, or atop a 14 story building. Life is not so kind in those environments and I have always felt that the dish portion of a system should be a one-time investment."

What does this type of 'stout quality' cost the dealer, extra? "We are typically 20 to 25% more money, for the same size dish, as those who bend metal and stick screen on a frame. But, if our antennas last a minimum of ten years, and a screen dish typically holds up for three to five years, the dealer and the customer are far better off going with 'stout' the first time around; don't you agree"?

MOUNT is designed and constructed to commercial specifications and should hold antenna rigid even in a 'big blow.'

Assembly

We started with a seven foot by seven foot pad, built at the WIV Tower Plaza location, sandwiched in between an ADM 20 footer and a Harris 10 footer. We should have made the pad just a foot longer and wider to give us additional maneuvering room. We survived on the 7 by 7 pad but life would have been easier had it been a tad larger.

The instruction manual provided is **THE** most complete step by step manual we have seen for any TVRO antenna sold widely in the home marketplace. It is a virtual textbook on site selection, pad or pier preparation, concrete work, re-enforcing of the concrete, and of course assembly of the antenna and mount.

The antenna is not difficult to asemble. Ideally, you would lay it down on its face and bolt the two halves together. Then you would lift it, turning it over in the process, and slide it-plus-the dish cradle onto the constructed three legged mount. We ran out of flat space to do it this way, so we suspended the two dish halves on some scrub brush just west of the pad, and installed the mount plus cradle all at one time. Then we rounded up several people and lifted the perhaps 300 pounds of surface onto the cradle and mount. Some of those lifting could have been 4 inches taller or so, but that was poor planning on our part.

Getting from bundles of galvanized pipe and two half antenna sections, to a mount with a dish on it required about two man hours. We loafed alot because Dehnert was having some difficulty adjusting to our bright sunshine.

USS has chosen to suspend the feed with a tripod (three legged) type of mount. The finish on the mount is extremely good and the metal work is superior to even what you expect to see on big dollar S/A antennas and the like. Everything fit together like it was supposed to. None of the hardware is ever likely to rust on us; it is well protected.

We connected up the Polarotor One feed, stuck a 100 degree Amplica LNA on the feed, and ran the RG-213 cable through to the rear of the dish and the downconverter. There we connected up an AVCOM 2B receiver (both the receiver and the LNA had been freshly removed from another 12 foot antenna on site, for direct comparison testing). When we turned on the electronics we were watching F1 at a 16.7 degree look angle. Not bad for eyeballing the north-south and polar axis settings.

And then the fun began. Running the dish, with the USS Motor drive, up to our highest fulltime video bird (F4) we adjusted the elevation (polar axis angle) for best pictures. Then back down to the west through the belt checking as we went along. Finally on F3R (look angle 19.4 degrees) we pushed and shoved on the tripod legs until we had peaked signal. Back and forth to F4 and F3R a few more times, making minute adjustments each time to the polar axis elevation and the tripod legs, and we had it. Full tracking across the belt.

It quickly became apparent that this 12′ (6″) antenna was just a tad better, all across the orbit belt, than any of the other 10/11/12 foot antenna we have installed and tested in the past eight months or so.

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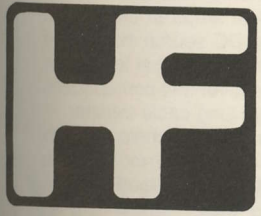

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What was particularly impressive was that the system was uniformly better, **from one end of the belt to the other,** and not just on selected transponder sets (or polarizations), or, a few birds here and there.

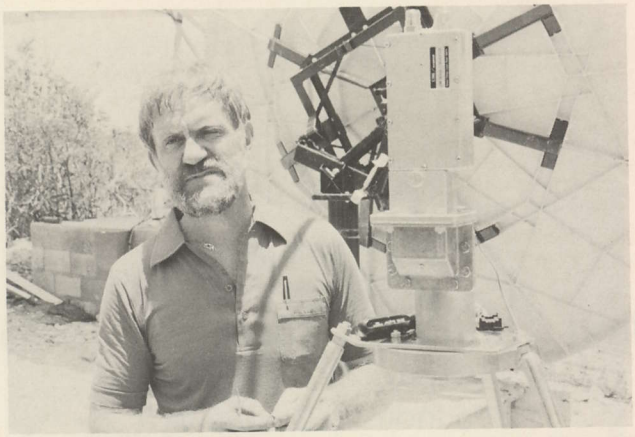
Dehnert has been a bug for exactness for some time. One of the standard procedures for his antennas is to haul them to southern California where he engages the services of a full blown 'antenna test range.' He started doing this several years ago, first as a way of getting a better handle on product gain. He knew after a year or two of trying to evaluate 0.5 to 0.1dB 'differences' in antennas using off-satellite signals that there were too many 'real world' variations in signal service levels to make repetitive measurements on different antennas over several days time. By the time he swapped the feeds, LNAs and receivers to insure that he was always using the same electronics, the relative levels of the various transponders being measured would change on him. "That left me with lots of wasted time, trying to refine the dish surface, the tripod feed mount, and the feed marriage for that last fraction of a dB of gain, and/or best control of the sidelobes. The answer was obvious; the antennas had to go to a qualified test range. We found one in San Diego."

This puts the USS antennas in a class that few others have to date attempted to enter. By having full antenna test range measurements on all products, Dehnert knows exactly what to expect from his antennas, and he is able to translate that into doing a better job of helping field users with say unusual terrestrial interference problems resolve those problems. "Unless you know where the sidelobes are, how strong they are, and how you can make small changes in the feed structure, for example, to shift those sidelobes around, you can't really help somebody out there solve a problem. We have that data and it has proven very valuable to us."

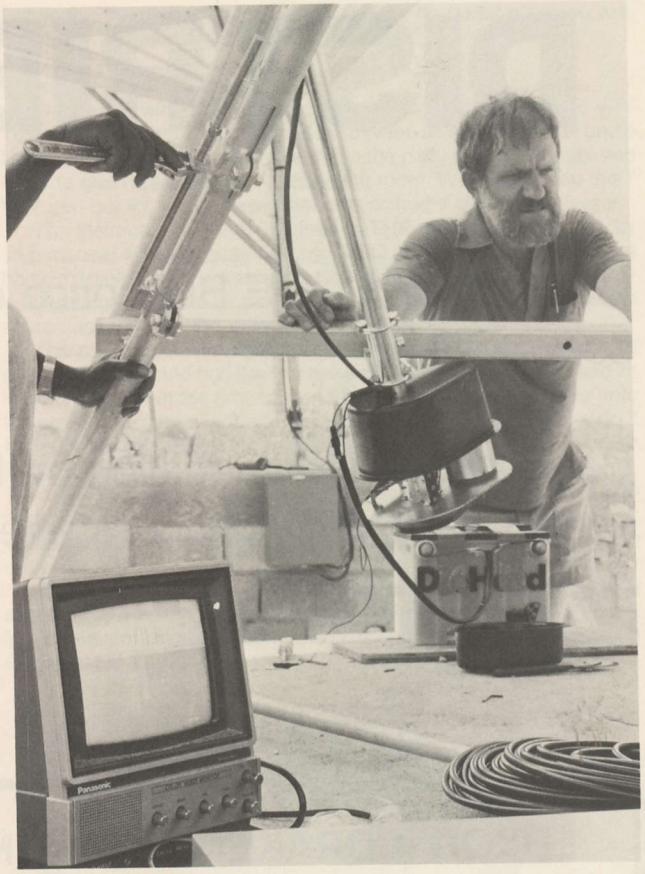
Dehnert's Model 380 'gain figures,' from the antenna test range results, are not really out of line when compared with some of the other antennas on premises at the WIV test range. His numbers average 0.5 to 0.7 dB better, on paper, than those we read from the similarly sized antennas now here. And that is just about how much additional signal we see, and measure, with his 12′ (6″) antenna, over others tested recently.

Dehnert on numbers. "I get a kick out of some of the antennas out there that make wild, and obviously unsupported claims, for gain and sidelobe control. I hold in my hand a data sheet for a 12 foot antenna which claims 41.5 dB of gain. That's possible, I guess, if you take the gain at the very top end (4,200 MHz or TR24) of the band. But here they claim 'First Sidelobe 18 dB typical.' Can you tell me where they got a number like that when the antenna has never been on a test range"?

We looked at the data sheet. It also suggested that the 3 dB beamwidth was 1.5 degrees. A pretty standard number for a 12 foot region antenna. What it did not tell you, even **if** the antenna was checked on an antenna test range, was 'where (reference the main beam center point) the 18 dB first sidelobe fell.' It might be plus and minus 2 degrees, or it could be plus or minus 4 degrees. You really can't tell from the published data.



RANGE testing on Provo includes full look at US and Canadian arc with particular interest paid to dish tracking ability and relative signal level from weaker Canadian and US satellites.



"Even before this 2 degree spacing thing came along" suggests Dehnert **"I was always concerned about proper control of the sidelobes. There were probaby times when I wondered whether spending all of that money and time on hauling antennas to a San Diego test range was a wise investment. Now I know it was"!**

If there is a weakness in the system, it would have to be in the complete motor drive package, including the controller. The motor drive is low (DC) voltage. That's good; it is a safer approach than hauling 110 VAC out there to the dish and running the risk of having somebody get zapped from the outdoor, exposed, wiring. Our concern is not with the motor drive voltage, nor the motor drive system (well engineered, nicely finished). Rather it is with the method used to get power to the motor drive.

To develop motor drive voltage, USS provides an outdoor enclosure from the outboard marine world, and a medium sized heavy duty battery. This means you have a battery, although enclosed and with appropriate pre-made cables, sitting on the pad at the base of the antenna. We question the decision to place a 12 VDC battery outside, even if enclosed. For one thing, there is the potential theft problem. For another, we suspect that the average user will not remember to service (as in inspect and 'top off') the battery except **after** a problem develops.

USS is hardly the only one using this appraoch; going way back to the original SatFinder motor drive home system, there have been many others with dish-installed battery systems. And there are no real, viable, alternatives for hauling up to ten amps of DC current through often long cable runs from a similar DC source inside, and protected. If you elected to calculate the voltage drop due to the wire for a 100 foot run, you would fairly quickly discover that perhaps 30% of the available power was being 'lost' in the long cable transfer.

We don't really have a better answer than USS's technique but do suggest to those who see the wisdom in low voltage (DC) motor drives that there is still room for improvement in this small region of 'technology.'

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Summary—
The USS 12′ (6″) antenna is certainly not for every home installation. By the time you package the dish and drive and feed, add an LNA, and receiver, you are well past the $2100 distributor price range, when dealing in ten lots. and you could be a tad higher if you are selecting one of the really fancy receiver systems, such as the USS Maspro line (which we intend to look at here in the coming months). On the other hand, it is a system that is tweeked 'at the factory' for maximized performance and because of its stout and well planned design, and construction techniques, you would be able to install the system and walk away giving a far longer survival and performance guarantee than you might with other 'lighter' systems. Frankly, we will be very surprised if we find a better performing 12 footer anytime soon down here on the Provo test range. Dehnert and crew are to be congratulated for staying with a product long enough to not only work the bugs out, but to also get as close to maximum theoretical performance as anyone is likely to achieve.

INDUSTRY AT LARGE

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E.T. In South Africa

Reference to your article appearing in the March 1983 issue of **CSD,** telling about the visit of the **Entertainment Tonight** crew to Provo. Well, believe it or not, the feature that E.T. produced as a result of that visit was broadcast by local television here in South Africa on the evening of May 24th! So your fame, or otherwise, has spread far and wide; even to South Africa. My impression of the programme was that it depicted you and your work in a favourable light (despite your mis-givings that they might not handle it that way, in the March issue of **CSD**). I have been a subscriber to **CSD** since last year and I must say how much I enjoy receiving this magazine. It has helped me build my own TVRO and I am building a receiver along the lines of Steve Birkill's equipment. Now that AFRTS is on the air with regular US feeds, I am redoubling my efforts to get the system perfected!

Harry J. Moir
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Johannesburg 2094
Republic of South Africa

Aww shucks (blush/blush). **Shortly after the piece ran, we happened to be in Fort Lauderdale putting together the April issue of** CSD. **We were amazed how many people stopped us in stores and shops to say they recognized us and had seen the piece** (the distinctive WIV 'T' shirt probably helped). **A week later, in Las Vegas, at the STTI show, we were standing in line to board a plane and a small child tugged at his mother's skirts and said** "Mommy, that's the man and his son who have that TV station we saw on TV". **Hours later while changing planes in Dallas, we were in the men's room doing what men usually do in the men's rooms, looking at the wall, and the guy in the next** 'pillbox' **leaned at us and said** "You look thinner on TV". **I'm not sure what part of us he was looking at, in the men's room. Fame disappears quickly however. A month later in Fort Lauderdale again nobody said anything at all except** "Get out of my way". **We wonder if Johnny Carson carries his own portable potty, or simply has developed a huge bladder.**

NEC What?

On May 3rd I received a telephone call from a gentleman offering to sell me 85 degree N.E.C. "54 dB gain" LNAs for a very low price, in lots of 10. I ordered 10, and being of a suspicious nature, I sent a cashier's check for 1/3rd the total. The balance was to be COD. **No LNAs.** I called on May 24th and was told that N.E.C. could not supply the units, and that they would therefore be made 'locally' by the company that represented themselves as 'agents'. I told the lady that I expected a prompt refund and I was told that 8 weeks would be required.

The company's name is Imperial Products Company (2200 Pacific Coast Highway, Hermosa Beach, Ca. 90254; 1-800-821-8753). Fortunately the loss of the money won't break me, but that put me in the position of having to scramble to find the LNAs for scheduled system deliveries. I must also answer to the many questions that resulted from my placing an advertisement in **CSD** (Page 46, June issue).

Bill Miller
PROMAR
P.O.Box 22133
Tampa, Fl. 33622

CSD **knows Bill Miller to be an honest, hard working, level headed distributor operating out of Florida. If Bill says this is what happened, this is what happened. To those who would be suckered into ordering** 'anything' **at what seems like a below-market price, from a source that is unknown to you, do some checking** before **sending off money. An 800 number is downright cheap these days and in a week's time a guy could clean up $50,000 or so by simply saying the** 'right things' **on the telephone.**

POOR REFLECTIONS?

In reference to the April issue of **CSD**. I notice that you have given quite a bit of space and time to the Paraclipse antenna. How about giving equal space and time to somebody else? As manufacturer of, as you call it a 'copycat antenna', think for a moment about this. Henry Ford created the Ford car and others copied portions and improved on it. Basically, that is what we have done. We took a good idea, and refined it further.

You shouldn't evaluate a product as to construction and means of assembly when, I feel, you probably do not have a manufacturing background.

1) Stainless steel bolts cannot be used with aluminum as electrolysis will occur. The same goes for the wire to hold the mesh on the surface; Zinc plating is the ideal solution.
2) Being critical of other antennas without first testing on an equal basis should not be done unless you are prepared to welcome all manufacturers at the same time.
3) Even if the design resembles another antenna, a person sould look at the background of the so-called copycat manufacturer;

AT LARGE/continues page 76

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FROM sun noise outage to a look at the first private terminal receiver product ever offered for sale (1978!); from the first experiments by pioneer Oliver Swan leading up to the development of the Spherical antenna design, to the sleek, sophisticated motor driven spaceage terminals of today. Everything that ever happened in this young, dynamic industry worth reporting is covered in detail and depth in this 1,000 (plus) page 'Textbook'!

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ONLY 1,000 SETS of this two year dual-volume Anthology were printed. If you think finding back copies of the monthly **CSD** is a difficult chore, wait and see how hard it is to pry somebody loose from their **CSD ANTHOLOGY** after the present supply runs out! **To Order** your copy or copies, **turn page over and use order form there!**

46 ISSUES YOUNG

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AT LARGE/continued from page 72

you may see that with good engineering and expertise, people can produce an even better antenna.

4) Besides all of this, we feel that regardless of calling our's a Superior antenna, it is a far superior antenna and we welcome the chance to allow **CSD** to test one.

I would appreciate your comment on this matter. I feel I have seen enough of one organization that sells and manufacturers a mesh antenna, and who apparently wish to give out the idea that they are the only ones who do so.

Richard F. Arbour
U.P.Satellite Dish Co.
Route 2, Box 41
Rapid River, Mi. 49878

Let's re-state the 'rules' for getting antennas, receivers, LNAs, modulators, filters, cables, brackets, mounts, motor drives, and left handed widgets tested at CSD.

#1) We will gladly perform testing on any product in this field.

#2) We don't charge for the testing; we will supply a detailed written analysis of our findings and make suggestions for improvement.

#3) We'll stand our testing procedures, and accuracy, against anyone else in the industry.

#4) **BEFORE something is sent down for test, we must have an understanding;**

A) If you are sending it down for test, and wish a private (i.e. non-published) appraisal, agree to that **before** the product gets here. Otherwise, anything submitted for test is assumed to be for **CSD** review. That means you take the good and the bad, however it comes out.

B) Our testing goes far beyond one-shot, take it out of the box, hook it up and see how it plays. Antennas stay up and are subjected to the stresses that Mother Nature has down here. Receivers stay in daily use. Ditto LNAs, etc. We reserve the right to go back and 're-visit' a product down the road after the initial tests. For an example of how that turns out, see COOP'S COMMENTS **in this issue.**

C) Products that are submitted for review, but which perform miserably, will **not** be written up in **CSD.** However (**and this is significant**), we also will not accept any advertising for **that** product in **CSD** either; **not until** the product is re-submitted and it then performs to at least minimum standards.

D) When we have a suspicion that we may have been shipped a 'super hot' item, we take it upon ourselves to go out and acquire a duplicate product, in the open marketplace, for review. That weeds out hand tweeked 55 degree LNAs that somebody tries to pass off as a 100 degree unit.

#5) The supplier MUST arrange at the **CSD** office (call Carol Graba at 305-771-0505) in Fort Lauderdale for the shipping. Big items (antennas) come down to Fort Lauderdale by whatever method you wish; they then are shipped to Provo on a boat (barge). Smaller items (all electronics, smaller antenna packages) NEVER go by boat (people who work on boats have a terrible affliction; things they handle 'stick' to the palms of their hands and follow them home. The grandson's of Ali Babba now load and unload boats!); they must come down by plane and Carol Graba knows all about this.

#6) If the supplier wishes, he can arrange to come down to be here when the antenna is installed, testing is done, or whatever. Several of the recent products sent down were possibly sent here so the manufacturer's people could get three days or so laying around in Paradise on the white, sandy beaches while local people brought them re-fills of 'Island Lemonade' **everytime their glasses emptied! That's between you and your accounting department; and Carol Graba, again, can arrange your air transportation and through WIV your on-island hotel accomodations.**

#7) We don't care if the lady you represent as your wife is your secretary. Neither do the island immigration control guys. Even the hotels don't ask such questions. That's between you and your 'wife'.

#8) If you come down 'sans-partner', **Tom Humphries is** not **in the** 'date-arranging-business' **and just because you think you have heard that people run around Provo espousing** 'free love' **is no guarantee that you won't spend the entire period of time playing with the knobs** . . . . . on the front of a TVRO receiver.

#9) You are not likely to get invited to dinner at the Coopers. Susan has seen all of the 'satellite folks' she ever wants to see and while you certainly will have ample time to inspect the two WIV locations and play with other systems already here, dinner is not included.

#10) If you happened to be crazy about 'fresh-made-daily' **ice cream, go on a starvation diet for a few days before you arrive. There's a brand new ice cream shop located at the WIV** 'Tower Plaza' **location and most of us somehow manage to balance the weight loss from being in the** (sometimes hot) **sunshine with the rapid consumption of fresh ice cream.**

#11) Finally, if riding in small (9 to 15 seat) airplanes makes you nervous, stay home.

That's the only way to get here now and it will probably be November before we have regular service from Air Florida, and possibly Eastern, on the big jets.

TWO Stand Out

Please accept my sincere "Thanks" and extend the same along with a hearty handshake to Bob Luly. The two of you have rekindled a glimmer of hope for the retail TVRO industry. Having worked in almost every capacity in this industry, I have, of late, been extremely apathetic about almost anything concerned with consumer earth stations. Unfortunately, the industry has been beseiged by crooks and thieves in an alarming number. There are too many out there who do not care one bit about quality (or else, do not **know** anything about it). I have heard testimonials and have been witness to a staggering number of cases where people were "taken" in one form or another. I actually find myself **hoping** that the courts or city councils **will outlaw** antennas, just to stop the pathetic flow of 'thefts' from the masses.

BUT! In this sea of slime and filth there towers at least two sturdy lighthouses; Bob Cooper and Bob Luly. My "thanks" at the first of this letter was to Coop for his efforts to make systems and installations **reasonable,** not necessarily outstanding; but at least acceptable. Making more of us aware that alot of systems being sold today last until the day after the warranty expires, and then rust and fall over, deserves the thanks of everyone who loves this industry and is not in it just to make a fast buck. Again, **Thanks Coop!** for the effort.

Bob Luly has already given so much to this industry that he deserves our thanks even before this **last** outstanding feat. I am, of course, talking about the protection and help he gave to Bob Taylor and his LPLL circuit (see **CSD**, May; 1983). Because of Mr. Luly, I feel secure that I too will get to enjoy the benefits of the LPLL circuit, and that it will not be wasted on just one company that I probably would never do business with in the first place. In case Mr. Taylor does not recognize it, not **all** of the crooks are at the retailing level. Unfortunately, there are too many at the manufacturing level also. Bob Luly has, indeed, earned the 'Pure Heart Award'. **Thanks to Bob Luly!**

I really do love this business and try to do everything possible to keep it going strong. I only hope that more will join with Coop, Bob Luly, and many that I have not mentioned, in working to preserve an industry that retains its potential for an excellent future.

E. Brian Wilson
President
ConsultSats
3746 Springfield
Kansas City, Kn. 66103

On behalf of Bob Luly, we accept your thanks. Bob has never benefitted from his own work and inventions as perhaps he deserves to. We remember this attending the SPTS show back in

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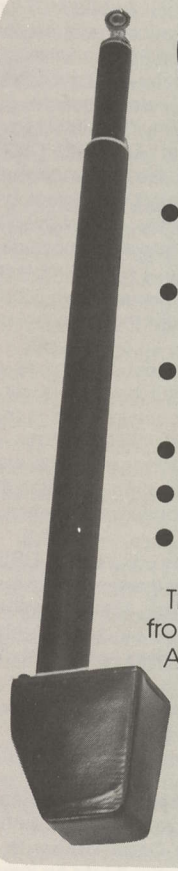

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Miami in early 1980; tucked in his pocket was his own, homebrew GaAs-FET LNA. Bob simply wanted to get better pictures than the commercial gear was getting him, at lower prices if that was possible. Since then he has pioneered portable (umbrella) antennas, rotating feed systems and a host of other products. Bob could have become a top selling receiver manufacturer. He could have become an LNA manufacturer. What he chose to do was to concentrate on those small, nagging problems that we all face everyday, helping out thousands as he went along. He's the kind of guy who will probably never be named industry 'Man Of The Year' by CSD, but when it is all over, he might make 'Man Of The Decade' for his persistent approach to solving problems. Coop's continued 'straight ahead' dash is far easier to comprehend. Since he started the industry back in 1978, he feels a 'fatherly' concern for what has happened and is happening to his 'child'. Any parent that cared would do the same thing.

MISSED One

Your April **CSD** article on block downconverter systems was very informative, but you missed the newest entry into the field. And that was our fault since we have not done any national promotion yet.

The product is the TX200 receiver with a TXDC 20 downconverter. In the State of Washington, this package currently delivers 24 clean channels with an LNA probe positioned at the 45 degree angle between vertical and horizontal. All of this through a single LNA and a single cable. We use the 440 to 920 MHz UHF band as an IF and absolutely control the cross polarization with Saw Filters. Our downconverter is set at the factory and requires no field or user adjustments. We have installed quite a few systems in the Pacific Northwest and the results have encouraged us to expand our manufacturing capabilities and to begin marketing on an international basis. Our system also works very well by connecting the downconverter output to an appropriate amplifier and an antenna, and sending the full block band through the air for a distance to the demodulator unit connected to another antenna (this is **not legal** where FCC rules function!).

At the risk of sounding like a poor competitor, I must say that I was disappointed that you evaluated the Anderson unit (April 1983 **CSD**) based upon one unit sent to you from the factory. We both know that Keith Anderson is something of a whiz at making electronics work; on a one time basis. Repeating that product, in production, is (however) a different story. I know; I installed several of the Anderson downconverters along with Anderson receivers. Regrettably, I had to replace every single one of those within three months as the equipment either failed or the video and/or audio deteriorated to a point that the customer was no longer satisfied.

In your review you spoke of 'hum' in the audio, as well as a hum-bar in the video. We had this same problem back when we were installing the equipment, and I feel it may have been inherent in the design. Based upon my experience, I feel that you should have checked at least one other 'off the shelf' Anderson unit. I hope that most **CSD** readers 'read between the lines' of your report and withheld making any major commitments until they could conduct their own trial installation for evaluation.

While I realize that TX Engineering is not yet an advertiser in **CSD**, I would none the less be pleased if we could send down a unit for test and evaluation. You could pick up a second unit from any of a number of Pacific Northwest distributors who handle the product, thereby giving you both a factory and a non-factory supplied unit to test.

Roger D. Linde
President
TX Engineering, Inc.
P.O. Box 7007
Renton, Wa 98057

Testing is not related to advertising. It never has been, and never will be. The only thing that affects advertising is a timely **placement of the advertisement order with Carol Graba. In a typical month, about a half dozen ads don't make it into an issue because** (1) **they are ordered after the deadline, or,** (2) **they are ordered late and our** 'quota' **for ads for the coming issue is fill up** (that happens every month), **or,** (3) **the ad is** (after study) **judged mis-leading or inappropriate or perhaps downright deceiving. Ideally, if this was a** perfect world, **we'd accept advertising** only after **we received a product and evaluated it for performance; just to be sure it really did what the ad claims.** This is not an ideal world **and demanding that would add 60 to 90 days lead time to new products getting into print. That obviously wouldn't fly. As for the Anderson gear . . . . we** did **obtain** a pair **of units. Both a pair or block downconverters** and **a pair of demodulators. Yes, we had the same problems** (as reported in April's **CSD**) **with any mixture of the four we tried. Yes, that does suggest to us that the 'hum' problems were inherent in the design.** HOWEVER, **after talking with Keith Anderson about this he asked if we were powering the equipment through a SOLA power regulator device. We were.** "The AC to DC supply in the receiver does not **like** the square-wave-like output from the SOLA" **Keith suggested;** "try it on an unregulated line". **We did, and most** (but not all) **of the hum in the video and audio went away. Only a tad remained in the audio side. Would we like to test your TX series? You bet! We'd especially like to try** (along with a standard test) **a package that** includes **a reasonable power level broadband** 'power amplifier' **which we could use with the downconverter and a** 'transmitting antenna' **to see just how effective such a system would be in covering say a mile or so across open land to a sub-receiving site; with no interconnecting cable. We have a bread boarded package similar to this** (but not in the 440 to 920 MHz range) **down here being tested now. Being able to send 12** (or 24) **satellite channels over a distance** 'wireless' **is one very neat experience. Our system is breadboard, not even of proto-type quality, at the present time but it shows great promise for serving remote parts of the world where terrain or distance makes universal sharing of a terminal impossible. We** still **believe it is possible to put in a single terminal** (where local government regulations allow), **use the 'IF' output of that terminal to drive an amplifier and transmitting antennas, to send the signal out over a region several miles across so that people living within the coverage area could individually, without interference, share everything coming off the satellite; without having to have their own** (or cable connected) **satellite terminal** (service). **We first had that dream two years ago. We won't give up until somebody does it.**

AAAH/ No Thanks!

Please be advised that we are now the new factory authorized sales and service dealer representing the quality line of Channel Master TVRO systems in the Lynchburg, Va. area. As a selling dealer, it is to our mutual benefit to be able to offer our customers a method of determining what programs can be found on what satellite/transponder along with general satellite TV hints and information. A review of your publication indicated that it is indeed a professional publication that will serve this need. In return for a complimentary subscription to **CSD,** we would be pleased to actively promote and sell new subscriptions to our customers at no cost to you. Thank you for your consideration, and please forward the appropriate order blanks along with your instructions for marketing.

Robert C. Hauser
President
Accurate Earth Stations
Lynchburg, Va. 24503

Don't think so. CSD **is** not **for TVRO users; it is the industry's dealer/distributor publication and frankly the typical user has no business even seeing a copy of** CSD **floating around your office. Ask yourself . . . do you want your customers seeing how much** you pay **for hardware? Do you want your customers without your technical background to read about field testing of antennas, or detailed discussions of 2 degree spacing? What the ultimate consumers do need is** Satellite TV Week, **and/or** SatGuide. CSD **is for people within the industry. That's the way it has always been, and we intend to keep it that way.**

REMEMBER UTV? The to-be satellite delivered cable TV service that stalled and stalled getting up first on one bird and then another? They were going to program about 18 hours of 'game shows' per day with viewer participation. Scratch it. Bankruptcy. A Hong Kong company plans to bring out a $9.95 parlor game called 'Satellite Monopoly'; if you land on the UTV square, your transponder fails and you are forced to spend two turns stuck on the NCN square, or until it turns into the Playboy Channel; whichever comes first.

TRANSPONDER WATCH

RECENT REPORTS OF ACTIVITY ON DOMESTIC / INTERNATIONAL SATELLITES

Send your reports to CSD Transponder Watch, P.O. Box 100858, Ft. Lauderdale, FL 33310. For late news, call (305) 771-0505.

RCA lost all of the horizontal polarized transponders on F3R at 2PM (E) on April 30th. RCA now hopes to collect $20M in insurance for system failure. F3 has been an unusual bird since launch, losing one transponder during launch sequence due to 'launch stresses,' subsequently having erratic bird control problems. Solar panel array 'stuck' in one part of daily rotation requiring RCA to 'hand control' the solar panel's sun tracking for a sequence each day. On two occasions, bird spun out of control without warning and technicians on ground were considered 'lucky' to have gotten bird back on station and operating under command.

EUROPE's first cable bird, scheduled to go up June 3rd was delayed to at least after the middle of June. Ariane launch pad was having difficult time getting L6 launcher retrofitted for ECS flight. If this one **doesn't** make it, entire European cable market development will be set back year or more. This was to be first European 'cable bird'.

NOT following NBC's lead, CBS has made decision to use 4 GHz transponders to interconnect entire national network. S/A and Harris will provide terminals in 7 meter region. CBS has been 'testing' interconnection of a half dozen stations in Arizona, New Mexico and west Texas for several months, hopes to have nine on line and in daily use of service by September start of new fall season. No timetable for complete switch to birds has been released. Present feeds include D3 (TRs 17, 10) plus several occasional channels on Westar 3 and 4. CBS says they will scramble service 'as soon as equipment acceptable to network use is available'.

FINALLY, the third US network, ABC, has re-confirmed to its affiliates its plans to use extensive C band bird transponders (up to 8) to inter-connect entire terrestrial network. ABC, like CBS, has been using D3 (TRs 8 and 13) plus a few on W3 and W4 for occasional feeds.

EUROPEAN SPACE AGENCY has upgraded their 'L-Sat' program to build high power DBS birds. Re-named 'Olympus', new 12 GHz region bird will be monster measuring 89 feet across, weighing more than 5,500 pounds and generating over 3.5 kW of solar power. Bird will carry one super power DBS TV channel plus six slightly lower (but still blockbuster level) 'commercial/business' transponders. Dish sizes down to 9 inches are planned with future generations of this series bird. ESA believes there will be a 'huge' world market for this super-powered DBS type satellite, forecasting as many as 150 worldwide by 1990s.

ENTERPRISING Japanese firm, meanwhile, quietly showing off proto-type 'wrist worn' combination TVRO and satellite connected 'mobile telephone' using 10 inch fold-out dish antenna. First you unfurl the dish from your wrist, aim it at the general region of the satellite, and then speak into your thumb.

FRANCE still worried about invasion of French homes by 'foreign', not-French-controlled DBS birds. They have offered one of their three DBS channels to Luxembourg **provided** tiny Luxembourg will drop plans for own DBS bird. Also under study is plan to erect 400 mile high steel mesh, picket fence around southern and western border of country to preclude any DBS signals getting into French homes.

CNN will be one of the program services on early-entrant USCI's DBS service. Again, don't expect 'innovative, new programming' on 12 GHz DBS; just the best (or perhaps the worst) of what we already have available at 4 GHz.

ATTEMPT to create single, standardized, DBS video programming technical format for use in all of Europe fizzled because . . . you guessed it. France said they were going to go ahead and do it their way, alone, without regard to how other European countries did it. Germany is next to decide; British pushing one system, French another, US yet another. World-standard DBS receivers? Not this century.

ARGENSAT, latest proposal to create a pair of 24 transponder 'national satellites' for Argentina, will go 'out for bid' in 1984. In addition to the pair of birds, more than 300 ground terminals are planned. Launch date? Not before late in 1987. Argentina will continue to use, and expand use of, Intelsat birds in interim.

ARTHUR C. CLARKE, appearing before United Nations in mid-May, talked of a world 'without walls' and an end to 'closed societies'. Clarke also suggested that the UN's continued debate over whether there should be a 'free flow of information' worldwide would 'one day soon be solved by engineers, not politicians'. **CSD's** planned industry trip to visit Clarke, presenting him with two or more 'gift terminals' in recognition of his inspiration to us all, coming closer all of the time. Details of present status in August **CSD.**

INTELSAT now has two, new, Global beam customers across the Atlantic; ABC and CBS have each taken a full time (half transponder) lease to continually feed news, reports and segments for specials from Europe (Goonhilly Downs, England) to USA (via Andover, Me.). Services in final leg, from Andover to NYC, can typically be found on D1/D2 birds with repetitive audio announcement identifying 'circuit'.

FINANCES for commercial industry leaders S/A and Microdyne looking better; both are back to profitable ways after lousy 1982 performance. Oak Industries, meanwhile, continues to post huge losses.

YET another plan for early entry into European cable community comes from Euro-TV, a Dutch firm that wants to lease a channel on Intelsat V with dual uplinks at Hilversum, Holland **plus** USA uplink at CBN in Virginia. If it 'flies', it could begin about the time you read this.

IN THE 'if it worked once' department; proposed FORD Aerospace dual-band (4 and 12 GHz) family bird (s) now before FCC for approval may end up being called 'T-Bird'.

ORION, the stand-alone proposal to launch with American money special satellite to connect North American and European cable industries, is still battling for life. Hearings in Washington continue; in-fighting is fierce. Most now feel plan **will** be approved in **some** form, but will have to survive certain court challenges.

MUZAK, on Westar 4 for some time, is upgrading service to 'stereo' with 200 new special receivers. If you stand in the middle of the elevator you'll notice the bass fiddles are on the right and the clarinets on the left. Except as you pass the 13th floor.

TAPS were played for first U.S. domestic satellite, Westar 1, May first. Bird launched middle of April, 1974, ushering in US domestic bird program. Originally planned as a 7 year bird, small 12 transponder package put PBS into satellite business and made it possible for everyone else to follow. Using last of thruster fuel on board, bird was ejected some 40 miles outside of nominal 22,300 mile orbit height and it will be allowed to drift on its own slowly westward. From 'satellite heaven' it will be virtually permanently in space, slowly moving over belt just miles below. Plans to retrieve over 16 miles of 1/4" audio tape,

wound on spool inside and containing permanent record of every transmission ever sent through bird since launch, proceed.

WARNER-AMEX is now using satellite capacity of F4 to link their cable systems in Ohio, Pennsylvania, Texas and Missouri. System will ultimately be 'inter-active' allowing cable viewers in all connected communities to respond to polling and other events.

NOT going well. NASA's plan to get first TRDSS bird onto station in Clarke orbit having problems; firing of banks of thrusters, originally intended to help bird stay on-station after a **successful** launch, resulted in 'overheating of thrusters' and far shorter thruster 'burns' than NASA hoped for. NASA had originally announced it hoped to have TDRSS into proper orbit altitude by middle of June. With problems, not likely, and, second TDRSS is now set back until at least 'early 1984' while original cause of problem (malfunctioning of Inertial Upper Stage) is still being investigated.

THAT police line-up you see on PBS transponder may not be staged; Confersat is leasing spare PBS time to allow real victims of crimes to inspect real suspects via satellite TV.

LOW orbit satellites (those usually launched from Vandenberg AFB, California in north-south path) will be test situation for Space Shuttle scheduled for launch next April. NASA plans to allow astronauts to leave vehicle, retrieve an orbiting (low orbit) satellite, bring it inside, and conduct repairs.

NUMBER six of nine planned Intelsat V satellites is stationed now at 18.5 west after launch in mid-May. Bird will take over 'major path II' duties and provide considerably stronger 4 GHz signals over Africa, South America, Europe and eastern portions of North America.

IF YOU like Eros (TR2, F4, Thursday-Saturday nights; 11PM to 2AM), you'll 'love' The PLEASURE CHANNEL; if, and when, it starts up with its own feeds on satellite yet to be selected, along about 1 September.

ANOTHER of those big dollar 'consultant studies' from a New England firm now tells us that 'impressive selection of 4 GHz programming' may be more than enough to 'offset price differential' some expect to see when consumers are faced with choice between 12 GHz and 4 GHz home packages. Venture Development Corp. (Wellesley, Mass.) concludes "Most severe threat to 'big dish industry' (4 GHz; that's us!) is threat of scrambling".

CHANGEABLE TED TURNER has decided he doesn't want to merge with somebody afterall. Perhaps most recent-quarter financial report helped him change mind; TBS now making money for first time.

YOU MAY have to see this one **work** to believe it. Last month's announcement that an Indiana firm was offering complete home TVRO for $39.95 per month on lease is followed up by announcement from industry supplier Birdview (Chanute, Kn.) that they have $8.3M order from Omega Satellite Products for massive number of 8 foot terminals. Omega says it will set $5 per terminal per month aside 'to pay for programming services'. Program suppliers are less than pleased with plan, see move by Omega as direct reason to hasten scrambling of F3R premium services. Omega is maverick SMATV operator, claims it will 'stick' individual home systems onto its present 'cable count' when paying programmers for service. Those who refuse to accept Omega payments? In the master list given to viewers, those channels will be marked 'unauthorized' and viewers will be 'advised' not to watch!

FCC's decision to allow 'phased in' 2 degree spacing for new and existing 4 GHz satellites really is not final answer. Still ahead is **who** will move, **when,** and whether the 'CATV/video' end of the belt from 119.5 to 134 west will ever really be 2 degree spaced. See special report this issue **CSD.**

SOME confusion as we go to press whether the launch of Galaxy 1, scheduled to replace older F1 at 135 west will be to 135, or, 134. Assumption made in our report starting page 8 is that Commission will have Galaxy go to 134 immediately after launch. If not, the first true 3 degree spacing will wait until later in the year.

OOOPS. State of New Jersey looking into reports that people living near massive uplinks around Vernon Valley suffer 'higher than normal' frequency of birth defects and cancer. Several new 'uplink teleports' are planned across country.

FIVE fall '83 SBS 12 GHz carried DBS signals would be launched

WATCH/continues page 82

into early 12 GHz market by international publisher and financier Rupert Murdock if everything announced comes off. His firm plans to use SBS 3 when launched late this summer, allowing 4 to 6 foot antennas over much of country, Murdock's marketing plans fluid, but include use of rural farmer co-ops.

MEANWHILE COMSAT's STC has decided to go for an 'early entry' as well, using five channels on SBS 4 bird to be launched in October of '84. STC expects 4 to 6 foot dishes to fly.

NBC also has jumped onto the SBS bandwagon, as predicted in **CSD** for April. NBC plans to use 3 meter dishes at affiliates with first service scheduled for early January of '84. They plan to have entire network operating via satellite by September of '84. Network will pay for dishes and terminals and Harris will supply.

COOP/continued from page 5

considered 'high technology' and as long as Section 1520A remains on the books, we will in the future be forced to play the Export License game.

Is there a way around all of this? Well, not necessarily around it. But you could transfer the responsibility for the Export License to another if you got yourself off the hook as the 'shipper'. The easiest legal way to get out of the loop is to put someone inside of the states between you and the foreign customer. If you shipped your products to anyone **other than a freight forwarding company,** then you are selling to 'that recipient'. Then it becomes **their responsibility** to get the product out of the country. They have to become the 'international shipper', and they have to worry about the paperwork. At least some of the non-US users of the hardware have established US shipping addresses, using 'agents' within the USA to receive their goods. What they do with it next, to get it shipped on to their own country, is their business.

Operation Exodus. Not something that affects very many of us. But to those involved in international sales and shipments, it is a brand new problem to be dealt with. Good luck!

MORE Provo Antenna Tests

May was a busy month at the **CSD** Providenciales test range with three separate 11/12 foot antenna systems arriving, with their 'masters,' on three successive Fridays. We look at all three of the systems here this month, and add the following anecdote which is being written after each of the antennas has been in, and performing, for up to a month's time.

Walter Grebis (Engineered Communications, Inc.) was the first down, returning with us from the states on May 13th. Walter's 11 foot antenna is what might be called an 'advanced proto-type.' He told me that approximately 25 had been shipped when he was down to see us, and that certainly means we are getting them 'younger and younger' all of the time! The Grebis approach is one of first designing a dish for maximum control of sidelobes (his area of the USA, New Jersey, has terrible terrestrial interference problems), and then trying to figure out how to soup up the gain. His .3 f/D dish works very well if you attach to it the Seavey relatively new, and also quite 'special,' .3 feed.

George Jones from the Confier Corporation was next down (May 20th), with his new 12 foot (16 section) screen mesh dish. Jones cheated a little and made it more difficult for us to evaluate the antenna **alone;** he also brought down a complete set of the new matching Conifer electronics (plus a Drake 100 degree LNA). We got one of the early Conifer 12 footers, although cagey George wouldn't tell us exactly how many had been shipped when he was here.

Then followed **Doug** and **Polly Dehnert** from United Satellite Systems (USS), with their 12′ (6″) commercial duty and commercial grade fiberglass dish. Doug's approach to antenna systems is one of going to maximum performance and maximum durability. No newcomer to the industry, he notes that while his firm has not attracted the widespread interest of some of the others out there, he's been profitable from the first year and is now going into year four.

Antennas brought to Provo for test, like any TVRO equipment sent down here, arrive in a rather unique test situation. With 7 antennas now installed on the tiny 100 by 200 foot lot at 'Tower Plaza,' and

another half dozen over at the WIV Studio facility, we have a rather complete handle on a very wide range of satellite products. Because the antennas 'go in' and 'stay in' we are looking not only at their apparent performance fresh out of their shipping crates, but the long term ability to hold up as well.

We took a sizeable antenna down a few months back; after two years or so of sitting out there getting buffeted by the 20-30 MPH 'breezes,' and the constant salt laden air that surrounded it, the antenna just developed a number of weak spots. We had a choice; either take it down, or quit using it (the performance had degraded that much). Or if we let it sit there, occupying valuable ground space, one day it would fall down on its own. Unfortunately there are two others headed for a similar fate before the year is out; their mounts or surfaces are simply deteriorating so rapidly that the performance is gone.

In safer and saner climes, people test antennas in the big time by subjecting them to wind tunnel and environmental tests. I suspect that the purposes of these 'brief' tests is more to create data sheet hype than to **really** find out **when** things start to come apart or degrade so far that the performance is shot. I have a much better test situation; every antenna here is put into real world service, and no less often than once per month somebody makes a detailed part by part inspection of the antenna, mount and support system. Since the antennas are in regular use, electronic (i.e. gain or performance) degradation shows up rapidly.

We have the most ideal test range I can conceive. Yes, there is wind and there is salty air. But more important, because we sit off to the side of the footprint 'boresights' we are in the unique spot of being able to determine, on virtually every bird, the **true** performance characteristics of an antenna system. We see differences in signal level between the strongest and weakest F3R transponders of more than 6 dB, for example. We have a frightfully weak D3 high in our sky (F3R is low), and it is a natural 'testing station' as we sweep from edge to edge of the belt. For the really difficult tests, we swing further east to the Intelsat birds (six plus are viewable here routinely, plus Ghorizont). With such a wide range of transponder modulation formats (from half transponder 15 MHz wide signals to the Ghorizont 50 MHz wide signals), with such a wide variety of signal levels (our strongest footprint is in the 32 dBw region and they go all the way to virtually zero from that high point), and with the built-in natural environment, this is THE place to find out whether a receiver, or LNA or antenna has what it takes.

After a few weeks to a month of watching the performance on the Grebis ECI antenna (11 footer/May 21st), the Conifer (12 footer/May 14th) and the USS (12'6"/May 28th), there are already some patterns developing. Patterns that did not stick out so vividly at the time everything was fresh and new, straight out of the boxes. Since we have also had some other antennas down for test in recent months, it would only be fair if we looked at those as well at this time.

While I will save a detailed part by part analysis for a later date, here are my observations as of mid-June:

1) **Paraclipse 12 footer.** Because a local scoundrel has been selling these as home terminals since January or so, there are now perhaps ten in the country. I get around to see many of them every month or two, so that gives me more opportunity to judge their 'value' than simply keeping an eye on the single one at WIV. **Rust.** Those clips that hold the mesh in place are rusting. Even the clips that are coated with some type of plastic. The plastic seems to get brittle and flake off, leaving part of the clip (initially) exposed. Not good. The hub assembly in the rear is also rusting on some of them, inspite of powder coating. Powder coating is supposed to be a cure-all for rust. Not here. the rust, even on the oldest antenna (seven months) is **not severe yet;** just an early warning sign. Performance, on the other hand, has stayed high on all of the ten or so down here. We have noticed that it is necessary or advisable to drill a hole through the large steel support pipe and 'pin' the circular pipe to the square tube post if you don't want them twisting off alignment slightly in very stout winds. We have suggested to the factory that a new factory-hole should be added so you have to drill only the round pipe and not the square pipe. We originally gave the Paraclipse an 'A+' for performance and design. We

lower the design to 'A-' but retain for now the 'A+' rating for performance.

2) **Harris 10 Footer—** This antenna got high marks for its design, and its (10 foot) performance. The primary problem we have discovered is that the sub-reflector feed shroud, into which you place the LNA, gets hotter than the devil in the bright sunlight. We stuck one of those small automobile suction-cup thermometers inside of the housing one day recently and it 'pinned' at 120 degrees before 12 noon. It never came 'off the peg' until nearly six o'clock. This raises the LNA temperature appreciably, and you can see the performance degrade during the afternoon hours because of the considerably increased LNA temperature. We tried to blow air through it (a futile effort without major surgery to the housing) to cool things down. Getting the LNA 'inside' to protect it from theft is a nice touch, but not when the LNA suffers with heat in the process. Drop their 10′ performance from an A to a 'B+'.

3) **ADM 20 Footer—** There are now three here, operating. Two of the three have ortho-mode couplers so we can simultaneously take off vertical and horizontal signals. ADM provides a mounting bracket that allows you to insert the ortho mode coupler plus a pair of LNAs inside the feed shroud. Unfortunately, this causes two problems. The feed shroud is not large enough or properly shaped to take two Amplica or Amplica plus Locom LNAs; for example. Offset-design LNAs, with a 'hump' between the front flange and the long, thin electronics bank, simply won't fit. The next problem is that in the process of getting all of the stuff crammed into the shroud housing, you lose your ability to rotate the feed plus LNA package to compensate for the 'vertical/horizontal' skew change as the dish moves across the sky. We solved this by substituting an Atlantic Microwave dual-mode ortho coupler in place of the Chaparral unit provided, and going back to the old fashioned Alliance Antenna Rotor to rotate the whole assembly by the few degrees necessary to re-gain cross-polarization integrity when we take the big dish through the sky from F3R east. ADM needs to re-look at all of this since more and more of their dishes are going into commercial installations where people both elect to go 'dual mode,' and, drive the dish from bird to bird. No loss in performance; still the best 20 footer around.

4) **ECI 11 Footer—** A month may not seem like long enough to tell how an antenna is going to hold up; we'll certainly re-visit it. The Provo 'style' pipe mount turned out to be a bad idea. If you opt for this one (see report, page **42** here) be sure you go with the standard mount. Re-adjusting north and south polar axis after each strong wind is a pain. The hardware is holding up very well, no signs of deterioration at all. We are not so certain about the Seavey feed; there has been a measurable (and noticeable) loss in performance on low-look angle F3R. If we knew more about the theory, and design, of the Seavey feed, we'd probaby be able to pinpoint the degradation. From an 'A' rating 11 footer to a 'B+' rating after 30 days.

5) **Conifer 12 Footer—** Some of the hardware Jones brought down, not properly galvanized or stainless, is showing signs of rust after three weeks. We'll be using Brillo pads to clean it up, and touching up the paint about the time you read this. Jones said (see report, page **48** here) that he wished he had brought the $35 option stainless steel hardware kit. We wish he had, also. Performance is the same as when it went in. An 'A' rating holds.

6) **USS 12′6″—** Two weeks is barely enough time to get 'acquainted' with the system. In particular, the dead-on tracking across the orbit belt (no loss at either end, nor in the middle) continues to impress us. With everything galvanized, or stainless, no signs of wear and tear yet. Our 'A+' rating for a 12 footer holds.

With consolidation fo the WIV television operations underway, at the 'Tower Plaza' site where all five TV transmitters plus the WIV-FM transmitter is located, space at that site is now at a premium. A 25 foot monster is scheduled to arrive late in the summer, after we accompany it to a test range where we'll share with you the steps that go into test range check-out for large antennas (in approximately the October

CSD). That, plus two 'still vacant' spots suitable for antennas up to 12 feet in size will complete **all** of the available space on **that** lot. And then there will be ten.

Meanwhile, at the WIV studio complex in Grace Bay, we are reworking some antennas and mounts preparing for a set of dedicated 'European/African/South American' antennas. Hopefully by having at least two large antennas trained to the east fulltime, we will be able to add some fulltime service from the Intelsat/Ghorizont birds on our miniature cable system. By next January, we will probably have the only cable system in the world where you can flip through 20 channels and bring in live TV from Asia (Moscow), Europe, Africa, South America and North America. If we could just figure out how to get Australia/Oceana in here, we'd have all of the world covered in a single cable system!

With this tremendous concentration of satellite hardware, and the never-ending parade of products to test and evaluate, it seems a shame that the only real avenue we have to share all of this with you is through **CSD.** So I am working on creating a non-profit, low-profile **'Satellite Research & Study Centre'** here on Provo; a place you can bring your family to and allow them to run wild on our beautiful, unspoiled beaches, diving/swimming/snorkeling or what ever turns them on, while **you** spend a few hours a day working with the equipment and technology located here. I'll keep you advised. It could well turn out to be the most ideal vacation/business trip combo for a satellite person that could be created. Oh yes, with our new 8,200 foot runway now ready for formal opening, and Air Florida 60 minute flights from Miami, or Eastern jet flights from New York City, Provo is getting closer all of the time!

ROBS At Work

After our November ('82) Provo Satellite Retreat, most of those attending decided that since we had shared shipwrecks, dunking satellite receivers in the sea, and watching Provo's new 'Navy' equip itself to protect the shoreline, we'd try to get together every now and again in the future. Kind of a reunion, as it were.

One of the many lighter moments at the Retreat had Canadian designer Jon Spisar squaring off with marketing type David McClaskey of Intersat. McClaskey was talking about his firm's hoped for sales projections during 1983. Spisar listened intently, and then looked McClaskey squarely in the eye.

"You and your wife Sue are very nice people, but you are a terrible Bloodsucker!" sputtered Spisar. Fortunately everyone was very friendly at this point and McClaskey was not alarmed by the frankness of Spisar. When Spisar was reminded that according to **Webster,** a Bloodsucker was . . . **"an animal that sucks blood, as in a leech,"** or, **"a person who extorts or sponges off of others,"** Jon explained what he meant.

"You people talk all of these big numbers. You talk about building 10,000 antennas, or buying 5,000 LNAs or shipping 15,000 receivers. Those are clearly unrealistic numbers and I think you talk such big numbers just to impress yourselves. You are bloodsuckers (with a small 'b')!

Well, the name stuck. And since this was the first of the Provo Satellite Retreats, we decided to form a fraternity of sorts. After some small discussion, we became the **'Royal Order Of Bloodsuckers,'** or **ROBS** for short. ROBS met next in Las Vegas at the STTI show in March. Only a few were missing and former astronaut Gene Cernan dropped by to say hello. McClaskey and Guy Davis of Intersat had made up some wall plaques commemorating our individual participation in ROBS and we talked about doing something worthwhile for the industry. In the group there are design engineers, manufacturers, distributors and dealers. There's even a cable operator. They are Canadians, and Americans. For a small group, there is amazing diversity. And because we all shared that week in Provo, closely associated with one another, there is more than a close friendship amongst everyone in the group. There have been no hostilities, and whenever three or more of the group are together there is an uncommon amount of good natured ribbing and plenty of laughter. But there is a serious side as well.

"Suppose we take a hard look at TVRO receivers" someone suggested. "We might be able to arrange for a Hewlett Packard engineer and some test equipment. It might be useful if we simply did

some noise figure, dynamic range and other tests on receivers to see what type of variations we find in the field."

ROBS member Tom Harrington, the guy who created **Coax-Seal,** offered us the use of his facility in Boca Grande, Florida. That's on an island off the west coast of Florida between Sarasota and Fort Myers. This is one of those little known, out of the way spots in Florida where the developers have tried to use intelligent long range planning to insure that the place is not overrun with side by side condos and all of the other ills of modern civilization. Headquarters became the Gasparilla Inn, a 100 year old (plus) establishment where for 8 months or so a year you have to be dressed in a suit and a tie just to get in the door. We were there during the 'off season' which allowed us to be the natural slobs we are without offending anyone. Once a Provo beam bum, always a Provo beach bum.

We invited John Ramsey of Sat-Tec and **Doug Dehnert** of USS to join us. John is a qualified, but not yet official, ROBS guy since he's been to Provo. Dehnert was scheduled for a Provo visit after he attended the ROBS affair. I had arranged for **Mark Davis** out of the **HP** Atlanta office to drag an 8970-A noise figure test set down for the tests. We collected on a Sunday, went Tarpon fishing on Monday, and got serious on Tuesday. The last to leave took off on Thursday.

Like any ROBS gathering, the best parts of the meetings are the meals, and, the 'bull sessions.' We eat well and there is something about watching **David Lyman,** a dealer out of Utah, eating his fifth piece of pie or sneaking around the table sampling everyone else's dinner that brings out the child in all of us. Lyman is or I should say was brand new in the industry last fall when he and brother Mike traveled to Provo. He barely knew which knob on a receiver turned it on. It is something very special to watch him tear into an engineer or OEM now, fully qualified to critique a product's performance or design. You can't hang around the ROBS group very long and not get a cram course education on the **real world** of satellite TV.

In the first serious bull session, we got started on equipment warranties and guarantees. That suited another guest, **Bill Young,** since Bill had come along to learn as much as he could about service and installation problems in the industry. Bill is the guy working with several of the really substantial insurance firms in the world, trying to put together a combination 'all risk/perils' insurance policy, plus a comprehensive extended warranty/guarantee program for the industry. I had turned to Bill for some advice on how this industry could create a mature combination program to get the dealers off the hook for faulty original equipment, plus get the consumers off the hook for faulty dealer installation practices. The April **CSD** survey, the results of which we printed in the June **CSD,** opened my eyes on just how severe the equipment reliability, and installation problems really are in the industry. I saw an opportunity here for a smart, experienced, insurance and warranty man to help us do a better job for the consumers and dealers.

TEAMING UP . . . David McClaskey (right) **and John Figura** (center) **of** Intersat **double team Utah dealer David Lyman on the merits of the new IQ-160 system. Lyman shut them up by advising he was going to handle GI's new unit instead of the Intersat.**

The second serious session got us off on Japanese and other Far Eastern suppliers. Several in the group were already heavily into using Far Eastern suppliers for both component parts and sub-assemblies. Doug Dehnert had the most to share on this subject since his MasPro receiver system is all made offshore. I'd love to have taped that discussion, led by Dehnert and Sat Tec's John Ramsey, since the rest of us learned more about dealing offshore in 30 minutes time than we collectively knew from a lifetime of being associated with things electronic. Their bottom line might interest you.

'The Japanese will win in any battle of mass production because they are simply better at what they do than Americans. The key is the heavy government support for Japanese technology programs, and, the absolute dedication of the Japanese worker.'

You may not like that message anymore than I did, but I must admit that I am now more anxious than ever to see some of the Japanese electronic assembly centers at work this coming November when a group of us head to Sri Lanka (to visit Arthur C. Clarke), by way of Japan. As John Ramsey noted **"The Japanese deserve to win; they are simply better at it than we are . . ."**

Lower 'grades' are given to the Taiwanese, but both Ramsey and Dehnert allowed that the Taiwan folks were going to be everybit as good and as dedicated as Japan in the next decade. They see it as the next 'Japan,' and note that most of the Japanese manufacturers now do sub-assembly work on Taiwan through wholly or partially owned subsidiary plants there. Far lower on the totem pole are the Koreans and Hong Kong/Singapore electronic centers. **"The Koreans are where the Japanese were twenty-five years ago,"** noted Dehnert. **"They specialize in copying equipment, right down to the trademark and copyright notices."** Ramsey related a story of a large shipment of Nicad batteries which he knew came in from one of these lower grade electronic centers. "The guy that ordered the batteries got a good deal; just over 50 cents per battery, landed. When he opened the box he figured there was a big mistake; they were Eveready batteries, **clearly marked as having been produced in the USA.** When he asked about it, he found out the batteries were precision **copies.** Can you imagine somebody going to the trouble of making exact duplicates, knock-offs, of Eveready batteries? An Apple II computer, sure. But a 50 cent battery???".

Elsewhere in this issue we look at the measurement system for checkng TVRO receiver performance. I had asked twenty different receiver suppliers to supply a unit on loan for the tests. About half of them came through. The rest probably figured we were going to publish a table of 'best' to 'worst' and they didn't trust us with their units. I had carefully explained that no such publication would take place, that indeed we were not 'rating receivers' but rather we were merely attempting to get a handle on how receivers varied under test conditions. The results were not terribly surprising, but what we learned about measurement techniques was. We'll have lots more to say about receiver performance ratings ahead.

Most of the ROBS group felt we had learned a great deal during our two/three day gathering. It's good to see that a group with diversified interests in the industry can get together without the pressures of a show or formal meeting, and accomplish so much. The atmosphere gets 100% of the credit for making these things work and Coax Seal's Tom Harrington was a perfect host who really went out of his way to see that everyone enjoyed themselves.

RESUMES To The Right

Back on May 15th or so a young satellite engineer from Texas was scheduled to move to Provo. We have an office/workshop set aside for him in the WIV 'Tower Plaza', and had begun to stock up on television sets, stereo gear, and VHF FM two-way radio repeaters and radios in anticipation. This chap was going to run the first professional electronics shop in the Turks and Caicos, minding the store from which equipment was being sold, keeping an eye on our almost fault free solid-state TV transmitters (9 now operating), our young FM stereo radio network (two transmitters), the nine TVRO antennas located at Tower Plaza, and be responsible for the installation and maintenance for the first two-way radio VHF repeaters in the country.

He didn't show up.

That creates an unusual position for somebody who is either

already in the television hardware/broadcast/two-way radio business, or who can learn enough to fake it before they arrive here. I'm only kidding about the faking it part; the guy we need down here in the Turks and Caicos will have to hit the ground running.

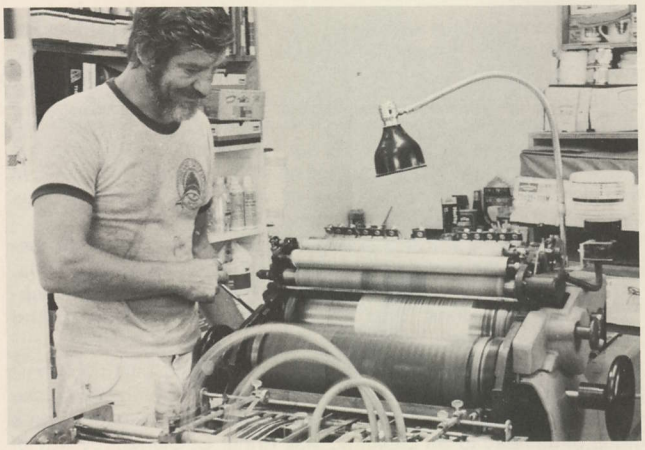
The deal we had worked out with the 'no-show' was that Tower Plaza would provide him with a place to operate out of, rent free, for a year. We'd handle the government paperwork so he could instantly go to work here. **He'd mind** our store, **we'd get** him started in business in his own shop. He would need enough modern test equipment to align and maintain VHF two-way radios and color TV sets. He should know how to work on VCRs and if he happened to be a ham, well, that would be pretty nifty since we went ahead and installed a whole raft of antennas at Tower Plaza so the no-show could be 'on the air' with his own VP5 ham license minutes after landing.

We are not looking for an employee; this is **not** a solicitation for a job opening. What we are looking for is someone who wants to be in business for themselves, sort of under our wing for the first year or so, to help them adjust to 'frontier living.' We'll provide him with loads of business, even giving free radio and TV advertising time to the business so that the whole country will know the guy is here and operating.

The 'no-show' figured that from scratch he was going to spend around $15,000 for the right test equipment and he felt he needed $5,000 after landing here to make sure he could live with safety until the bucks started pouring in from equipment repairs and sales. That sounds like a reasonable nest egg to get started, to me.

There are several severe drawbacks about living here. **Number one,** you'd have to operate from a shop less than ten feet from Tom Humphries; past President of SPACE and now the only print shop operator in the Turks and Caicos. Humphries also dabbles in TVRO distribution and dealer activity and the bad part about being next to him is that he swears at his printing press alot. Loudly.

The next severe drawback is that if you are a 'Ham', a VP5 'call' is the next thing to being a DXpedition. They line up in huge pile ups to work you, especially from Europe, the Far East and Asia. That's why I don't operate much on ham radio anymore; I don't like working those guys at the rate of four per minute. I'm getting too old to fill in my log that fast.



HUMPHRIES in his print shop. Beer, a bevy of British broads, Barracuda and other base pursuits.

If you happen to be a sunshine and salt water nut, that's the next handicap. Humphries practices the 'religion' of Scuba diving, and there are many advocates on Provo. You'll have a terrible time deciding you should work when only five minutes away is the most beautiful undersea reef in the world. A person without great resistance to temptation would be in big trouble here.

If you have a closet filled with winter clothing, that's your next problem. Since in three years our coldest recorded temperature has been 63 degrees, you'll probably want to leave the woolen underwear behind. And that presents a severe storage problem.

COOP/continues page 90

Two-Step into Stereo

Step One: Challenger 421 Satellite Receiver

A new, compact Arunta receiver engineered for quality video and monaural audio reception at an affordable price.

421 Features Include:

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Step Two: SSP-318 Stereo Processor

The SSP-318 Stereo Processor is the perfect add-on for any existing TVRO system to give full stereo reception in multiplex, matrix, and discrete transmission. The 318 matches the Challenger 421 to make an attractive component system.

318 Features Include:

- Solid State IC Circuitry
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- Loop-through composite video interface
- Multiplex stereo indicator light
- Single or Dual subcarrier demodulation
- Matrix or Discrete mixing
- Left, Right, Monaural channel outputs
- Narrow or Wide I.F. deviation selection
- Dynamic range expansion
- Canadian Filter
- Twin center tuning meters
- Automatic Volume Compensation
- Dynamic noise reduction

COOP/continued from page 88

If you don't like informal living, wearing T shirts, cut offs, sandals and carrying a half empty cold brew around, you'll not make it here. One guy who came down and saw Humphries went back to his former employer (M/A Com) and reported Tom had turned into a "**40 year old** hippie, **driving a beat up old pick up truck, loaded down with cold beer, diving gear and a bevy of English girls who didn't appear to have much on their bodies**" when he saw them. Of course you could be strong of will and resist the temptations that have been the undoing of Humphries. You could also stay in Hackensack.

Seriously, we'd like to get this service thing taken care of. Either a young fellow, preferably without family (small children **are** here, but schooling is difficult), a middle-aged 'drop out' like Humphries, or somebody who has a reasonable nest egg socked away and who wants to retire to a casual life style Caribbean island, would be ideal. The guy (I hesitate to say gal, although certainly there are many so-qualified) will have to be a hard worker, not be easily distracted by beer and broads and Barracuda (that's a fish you see while diving), ready to give up punctual living, formal life styles, and 'rules' to live by (you make your own up here), and, not be destitute. Smart we'll accept. Poor is no sin but you'll have to take the opportunity and run with it, and provide your own 'fall back' position if you get here and find out you can't hack it.

The nest egg, and the right test equipment, is important. A one bedroom apartment, furnished, will cost you $500 to $600 a month here. And they are hard to find. The first time you pull your car up to the gas pump (you'll have to bring down a good, servicable vehicle like a used pick-up truck), and pay $2.05 a gallon, you'll remember you are not in Dallas. If you eat normal, and cook your own meals, you might get by for $100 in raw groceries per week. If you drink lots of cold beer, you spend $2.00 a bottle in the pubs or $12 a case at the grocery. That's the nasty side. On the bright side, you'll get paid very well by your customers for the radios you sell, or the TV or two-ways you repair. Their only alternative is to send the stuff 700 miles back to Florida and wait weeks to get it fixed, plus pay shipping and hassle with customs on both ends. It is a built-in-market. There are probably 250 TV sets alone, sitting **broken** in closets here; another 50 to 100 VHF marine radios 'down', and on and on. Like I said, the guy who does this will have to hit the ground running. Even as he is flying down with Provo Flying Service, owner Ed Hegner will be asking him if he can find time to repair some of his Avionics radio gear. There is no end to it.

I am **not** prepared to spend hours telling everyone who thinks they are ready to abandon civilization for Provo all about Provo. That would take far more time than I have available. What I suggest is that those interested sit down and write me a **long letter** telling me all of the reasons you have to want to come here. Include how you plan to handle the test equipment and nest egg problems, and when you can come down for a look-see visit. Just getting down for a weekend will set you back $500 from the time you **leave** Fort Lauderdale until you are **back in** Fort Lauderdale, if you stay here three nights and fly with Provo Flying Service. So there is an element of risk involved, even in investigating the opportunity.

Oh yes.

Being the first to get a letter to us will be secondary to being the 'best qualified' person we come up with. Maybe nobody will write, in which case Humphries had better learn how to fix TV sets and two-way radios while his printing press is running!

THE SATELLITE Expert

Hard on the heels of the notice that we have a new problem with the shipment of 'high tech goods' outside of the USA, there is the nearly tragic story of a man who decided he would be 'king' of a relatively well known African nation. The 'Satellite King'.

Many of us hear weekly from well meaning people scattered all over the globe. These people have read or heard about satellite television and from the usually sketchy printed reports they have no way of knowing that you can't set up a terminal in Tanzania or Liberia or Tunisia, for example, and tune in HBO or WTBS. The reports they read tell how wonderful, and 'world wide', satellite television is and often the reports mis-lead the readers into believing that for $3995 or

$13,995 or whatever number, they can be escalated into the middle of the great American satellite bonanza. Such people are, understandably, excited. They hunger for information, and they thirst for the opportunity to have their own terminal.

Often when a person is approached with a request for assistance in establishing the 'first satellite terminal' in (fill in the name of your favorite foreign country), there are well meaning but hardly substantiated 'market projections' floating in and out of the conversation.

"We have no television in Liberia" the conversation might begin. **"Can you help us get television, via satellite?.** Even if you don't know where Liberia is, that seems like a pretty nifty 'business opportunity'.

"We can sell several thousand terminals here. And, price will be no object. Why we might sell them for as much as $30,000 each!" exclaims the Liberian. Now the guy has your attention.

"Look I have a friend **who is the** cousin **of the President. We can get the equipment into Liberia without paying any duty at all"** says the Liberian. **"We can even get an exclusive** license **to bring the equipment in, and nobody else will be able to get a license for twenty years or more. We can make millions".**

The guy from Tanzania, or Liberia, or whatever, has his 'selling shoes' on. He has a real sucker on the hook. What he wants is for somebody to show him how it is done. He wants somebody to be dumb enough to believe that he really does have a friend who is 'the President cousin.' And that he can, indeed, 'get around' all of the government paperwork, and get a 'twenty year license' to be the exclusive importer of the product.

The US guy is barely conversant on satellites himself. He has never put in a terminal with his own two hands. He has never tried to make a dish track. He has never hooked up a receiver on his own. But he forgets all of this because he sees millions of dollars laying out there on the ground in Liberia. So he throws common sense to the winds, and jumps in with both feet.

Weeks later our US satellite student is in downtown Monrovia. That's the capital of Liberia. In a box he has a DX Receiver, an LNA and some cables. In another box he has a 12 foot Paraclipse antenna. It's hotter than hell in Monrovia in April and he knows he is very close to the equator. And he's in Africa. But he doens't know what to do next.

Fourteen overseas telephone calls later he has the Paraclipse more or less together. Monrovia is only 8 degrees north of the equator, so the antenna should be all rights be pointing almost straight overhead. Only our friend thinks he is south of the equator, rather than north. So he spends the first two days trying to find satellites to his north. Remember, he never did this before himself so even if he was pointing in the correct direction, he would be in big trouble. Naturally, looking north, while still north of the equator, only compounds his problem.

After a couple of days looking in the wrong direction, he finally decides to read through the Steve Birkill international satellite manual. He's not read it before. It was far too technical to attract his attention. But now his friend, the guy who has another friend who is the cousin of the President, is really getting steamed. Days of looking and no pictures. All of the people HE told about satellite TV, those people who were going to lay down $30,000 cash per terminal, are starting to bug him. **'Got pictures yet?'** they are asking. So our traveling American 'soon to be millionaire' satellite 'expert' decides he had better figure out what is going on here.

That's when he discovers, for the first time, that he is looking in the wrong direction. That could be embarassing when he has to tell them to turn the antenna around the other way. He thinks quick and then reports ' I just checked with my contacts in the states. The satellite operators have moved the satellites to the south; something to do with the Russians. We have to look for them in this direction now (pointing south)'. The Liberians don't know the geo-stationary orbit belt from a chunk of mahogany so they go along with him. Afterall, 'this is the great American satellite expert'. Right?

Another day passes. Then, as the day is ending, quite by accident, the dish stumbles across a satellite; virtually dead overhead at 14 degrees west. There is wild excitement. People appear from behind the trees, and huts, and fences. **"American television"** comes the

COOP/continues page 94

"I was sick and tired of undependable earth station controllers.

Peter E. Kent
President

I'm an engineer, so I made one myself! I'll stand behind this one."

The best earth station controllers on the market are programmable, reliable, easy to operate and priced right. When I looked closely, I soon found several design flaws which could have been corrected before they were put on the shelves.

It annoys me to see a product on the market before it's thoroughly tested. As an engineer, I expect things to work and keep on working. After all, that's what engineering is all about.

My wife sometimes says I'm stingy. She's right, but I also understand that quality costs less in the long run. So, I keep an eye on every penny and I make sure that our products are the very best.

My engineers and I carefully designed and tested the Surveyor Eleven– a reliable, dependable, convenient and reasonably priced satellite locator.

Here are the features that make the Surveyor the best on the market today:

1 **2-Year Warranty** I know the Surveyor Eleven works, so I'll give you a two-year warranty on parts and labor. See what our competition offers.

2 **Reliability** No other controller uses a true closed loop servo system which gently starts and stops the motor. You get much longer life from your motor, gears and actuator.

The Surveyor Eleven prevents motor burnout by limiting maximum torque and by delaying reversing power.

3 **Safety** The Surveyor Eleven has UL Registered 90 VDC motor drive circuits.

The red LEDs tell you when your actuator has reached the adjustable maximum limits.

Both red LEDs light up if a control wire is disconnected, saving you the expense of a service call.

4 **Fail-Safe Memory** The Surveyor Eleven never loses its memory during a power outage. Just set it and forget it. You don't have to remember to change the back-up battery every year.

5 **Locks on Target** The Surveyor Eleven is immune to miscounting from stray noise pulses.

It's also so accurate (within 0.030 inches of dead center) that it doesn't need fine tuning.

Settings won't drift because our circuits compensate for line voltage fluctuations, temperature change, aging and noise pulses.

6 **Optional Remote Control** The optional remote control unit brings the convenience of the Surveyor Eleven right to your easy chair.

7 **Easy Operation** The Surveyor Eleven is simple to install, simple to program and simple to operate. One knob selects up to 12 satellites.

This earth station controller has something entirely new. All the same reliability features you have come to expect in the Surveyor Seven are now in the new Surveyor Eleven–plus three new features that put us further ahead of the pack:

1 **Skew Compensation** The Surveyor Eleven automatically and accurately compensates for skew and the backwards Westar satellites.

2 **Polarization** You can set the Surveyor Eleven to horizontal, vertical or receiver/remote polarization with the turn of a knob. No need for a separate box.

3 **Scan** Exclusive to the Surveyor Eleven is the Scan function. It allows you to search through all 24 channels for the one you want without switching from horizontal to vertical polarization.

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- Remote Downconverter
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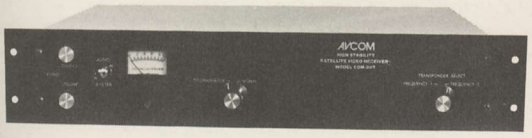
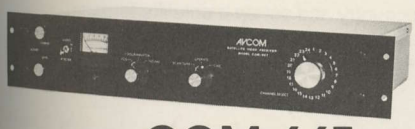
COM-2B

NEW from AVCOM



COM-20T

AVCOM's COM-20T High Stability Satellite Video Receiver is the answer to your need for a highly stable and reliable receiver for cable, private cable, radio stations, TV stations, BIZNET, News, Weather & Music Services, and other dedicated applications. The COM-20T can be factory or field adjusted to a particular transponder and will remain on frequency without attention. The COM-20T is normally supplied with a remote downconverter and tunable audio. Optional configurations include fixed-tuned audio, internal downconverter, and downconverter switching for multi-channel capability. Styling matches AVCOM's popular series of rack mount receivers.



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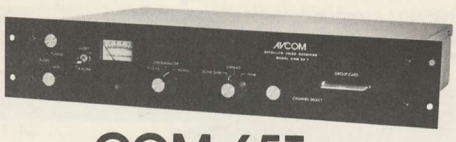

COM-65T

✷ Commercial Quality ✷ Compatible with SA's 6650 system ✷ Rack Mount, standard Double Conversion ✷ Flexible Downconverter (Use any degree and brand LNA) ✷ High Stability

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All other inquiries phone 804-794-2500.

COOP/continued from page 91

cry. Well, not quite.

Our American friend has never seen this type of television before. But after a few hours he figures out that he must have Ghorizont; the Russian monster bird that spills out a big, fat signal over 40% of the earth from 14 west.

For the first 12 hours or so nobody wants to allow the American 'expert' to move the dish. It took them several days to get pictures, and while the pictures they have are not high quality by US standards, it is far better television than Monrovia residents are accustomed to watching. Their local service is on the air perhaps 5 hours per day, with a mighty 500 watt transmitter. Eventually he is allowed to move the dish, in hopes of finding those elusive 'HBO' and 'WTBS' signals. After nearly another day of trying, our American expert decides the best thing he can do is beat it out of Liberia and back to the safety of the states. A story about how the present President gained power may have had something to do with his decision; the present one shot the last one.

Meanwhile back in the states, the chips are starting to fall. The US Embassy in Liberia gets a report that an American 'Satellite Expert' has been in town, and he has left behind a terminal that is bringing in television. The American Embassy investigates and finds out, sure enough, this is true. But then the Embassy learns that the terminal is bringing in Russian television. 'Red Flags', bells and whistles go off all over the American Embassy compound. **"Russian television, in Liberia, brought in by an American 'Satellite Expert'???".**

Teletype text flies to Washington. **"What does Washington know about an American, perhaps hired by the Liberian government, to bring Russian culture** (i.e. television) **to Liberia???".** Washington doesn't know anything, but they will find out.

A CIA type travels to the town where the American lives. He talks with some acquaintances of the American. **"He told** me **that he had contacts inside the CIA; that he was being hired by the CIA to put in those satellite things in Liberia"** one acquaintance relates. The CIA field man decides it is time to get back with Washington. There could be some sort of top-level, covert activity here. One that is classified. He doesn't want to step on his own people.

After a day of solid checking in Washington, nobody can find any record of our friend having **any** CIA connections. The closest they come is to learn that our friend's wife once worked as a receptionist in an FBI field office; twenty years or so previously.

Back into the field. And meanwhile the Liberians involved in the fiasco are feeling some heat. The President has gotten the word; some of his people are watching **Russian** television, and the **American** Embassy is alarmed. The Liberian president promptly advises the Embassy that this all happened without government knowledge. **"No, there is no attempt here to turn Liberia into a puppet of the USSR by bringing in Russian television. No, the Monrovia transmitter, all 500 watts of it, is not about to become a broadcasting station for Russian television".**

Lest you think this is all fantasy, think again. **This actually happened during April.** The chips were falling all the way to the end of May. They may still be falling as you read this. And there is a warning here for those who don't understand what happened.

(1) You can't march into a country and set up a satellite terminal, unless you have some idea of what you are doing. (A 12 foot Paraclipse and a DX receiver, as fine pieces of equipment as they are, were never designed to bring American satellite television to Liberia!)

(2) You can't get a big head about how 'important you are' and fabricate stories about the American government and the CIA backing you in some foreign country. (It doesn't take a James Bond fan to figure out that the CIA and other covert-agency guys play for keeps, and you'd better not try to get a game on their court if you are not in their league!)

(3) Leaving behind Russian television, and ONLY Russian television, in a country where the American influence is precarious at best, is not a smart thing to do. (You are, afterall, an

COOP/continues page 96

ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.

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COOP/continued from page 94

American. And in case you haven't noticed, there is a tiny bit of conflict, worldwide, between the Russian and American systems!)

(4) Hauling high technology stuff out of the USA, unmarked and undeclared, and without appropriate 1520A Export Licensing is a terrible mistake. (Especially when you stir up a hornet's nest after you get there!)

(5) You had better know which side of the equator you are on!

This guy is relatively well known in the industry. He tells people **"I don't know much about the technical side of this business",** and sure enough, he proved that in Liberia. He also proved that it is still possible for **one American,** acting without both oars in the water, to be a dangerous instrument of unintended foreign policy. A satellite terminal, in the wrong hands, can be a dangerous instrument. If you have any doubts about that, ask the American Embassy in Monrovia, or, the U.S. Department of State in Washington. They have quite a file going now and it ain't over yet.

IF LIBERIA ISN'T YOUR Cup Of Tea . . .

There has been an uncommon amount of activity in the Middle East of late, on the 'home' TVRO front. You have to understand that a typical TVRO **home** in Saudi Arabia, or Kuwait or elsewhere surrounding the Red Sea in the oil rich arena is not your typical American suburban home. There are thousands of Sheiks and Princes and what have you still holding forth over minor, but very wealthy, 'states' or 'provinces' within their arrid lands. They have the bucks, and the 'yen' for modern technology. One of them is equal to perhaps 10,000 of us. Or, 1,000 of them are equal to ten million of us. It therefore becomes possible for a few hundred of 'them' to represent some exceedingly large dollars to say the American advertising market.

I judge there to be between 30 to 50 terminals now in operation or under construction in this region of the world. I know of one supplier now a third of the way through a contract to deliver 65 terminals in the 6 and 7.5 meter size, to this region of the world. By year's end there could well be 100 such terminals there; perhaps more.

All of this activity, although the numbers seem very small to us by comparison, has not gone unnoticed. On either side of the Atlantic. A guy selling drill bits, for example, would just love to tell Sheik this or Prince that about his diamond tipped carbon steel deep well drilling bits. If he could reach that Sheik or Prince in his bedroom, so much the better.

A fellow named Omar Duwaik is President of something called 'CICO,' which is shorthand for Computerphone International Corporation. I understand that Omar has raised $36 million in 'venture capital' to provide American style television to a number of different 'Arab' countries. Since that is about half the money you need to build and launch a 24 channel modern satellite (just to put the bucks into perspective; not to suggest that is what he is up to), Omar has alot going for his plan. Now, what is he up to?

Omar raised $36 million from an 'Arab Consortium' to haul American ABC, CBS, NBC and 'other' style television across the Atlantic to Saudi, Kuwait, and neighboring areas. Omar also went to the folks at Intelsat, back late in April, and tendered a formal request to lease a pair of Intelsat TV transponders. Omar wants to send American programs via Intelsat to Saudi and the region surrounding Saudi, probably via the same 1 west bird that is currently carrying AFRTS (see **CSD** for February, 1983) to the Persian Gulf region.

Since $36 million will buy alot of transponder time (at Intelsat rates, he could have about nine years worth of Intelsat fees socked away with a $36 million kitty), one might wonder how he plans to spend that dough. Omar has that figured out.

They plan to use a pair of transponders, in half transponder format, so they can ship four simultaneous programs east. One each ABC, CBS, NBC, and, the fourth will be split between WTBS, CNN, and a big list of others. The programs will cost them a few bucks, but not enough to 'dent' the $36 mil. Then on the ground, Omar figures to get his money back.

The plan is to wire, **as in cable,** big chunks of large Arabian cities. They'll program some of the channels with tapes, from throughout the Arabic world, some channels directly off of Intelsat and other birds

visible to them, with European programming, and of course at least four channels with American television. At perhaps $50,000 per mile cable plant costs, Omar **could put in** 720 miles of cable plant. He'll probably be using some of the relatively low cost 20 channel plant systems, however, and squeeze in for under $20,000 per mile. That will build his 'consortium' more than 1500 miles of cable plant, buy them two full time Intelsat transponders, and give them enough operating capital for several years. Very slick.

Will Omar scramble his service via Intelsat? They are not sure, but there is certainly that possibility. We mention this so that readers in Europe and Africa don't run out yelling **'Love Boat Is Coming'** into the streets of their villages. Maybe, but it could be scrambled in the process.

Omar Duwaik. A man with $36,000,000 to spend on bringing American television to the middle east. Those who want to help him with the project will find his office in Denver (where his firm is listed at Suite C, 1925 S. Rosemary St., 80224); 303/751-6100.

JV Who?

The June issue of **CSD** carried some comments of mine concerning that controversial distributor Joe Valentino. I closed the comments by noting that Joe was arranging to bring down a pair of new-to-the-industry antennas for test on the Provo 'range.' Well, he has come, and gone. And in the interim I have had a few more letters from dealers who are having problems with Joe.

Unraveling the controversy boiling around JV is abit akin to being a participant on the panel of 'To Tell The Truth,' or, 'What's My Line?'. Someplace in all that we hear and see there is a complete truth.

While here on Provo Joe said to me, almost as an afterthought, **"There is no more JV Electronics."** When I didn't respond he added **"We lost $125,000 last year and now we are JV Satellite."** People who lose big sums of money, and change their names, usually are trying to get out from beneath a stack of debts. Or 'hide' from prosecution.

In another discussion concerning how dealers can survive when they are dealing with OEMs or distributors (or both) who will not stand behind their equipment properly, Joe seemed genuinely concerned that dealers **do get stuck** when they should not. I raised another side to the coin.

'But what about the distributor who tries to help out a dealer. The dealer has a problem and the distributor agrees to send a replacement widget that day. The dealer agrees to return the troublesome widget he has the same day, the same way. What happens then?' I asked.

"They often don't return the broken unit; they keep them both. That's why I lost $125,000 last year as JV Electronics" was the response. And he added "Where do you draw the line? I take on a line of antennas, or drives, or whatever. The OEM is new to the business and after we get some into the field there are problems. I feel sorry for the dealer having problems, and somewhat responsible. Then the OEM goes out of business and I'm in the middle. The dealer has a defective unit. I collected the money from the dealer, paid the OEM, and then I find myself being asked to make good for the broken unit which the OEM is no longer available to guarantee. I didn't guarantee the unit, the OEM did. If I received a guarantee or warranty, I passed it on to the dealer. But the dealer looks to me for a refund, since the OEM is gone."

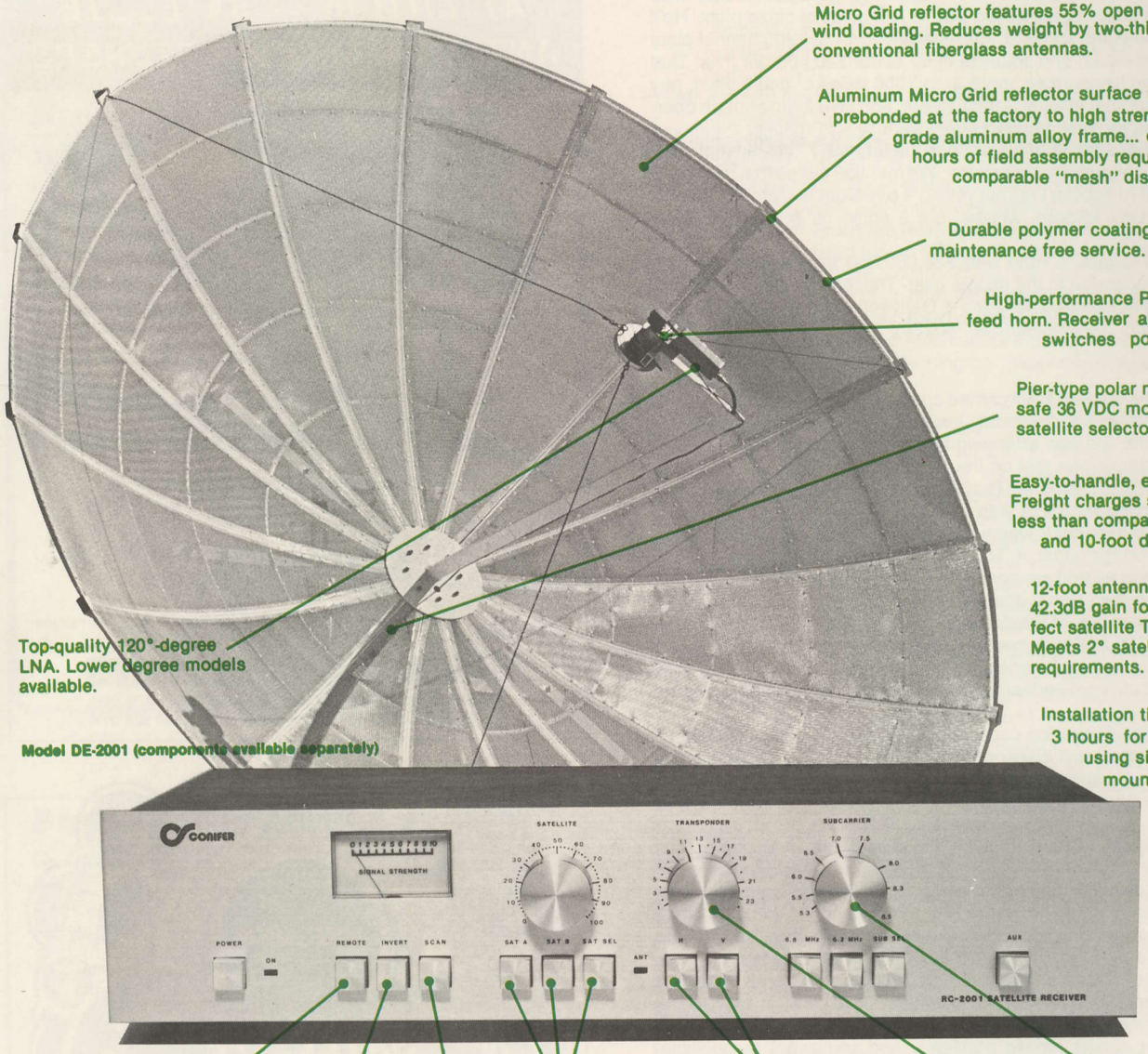
I can see how JV lost $125,000, or at least some money, in 1982. They were acting in the wrong capacity if JV refunded money for products it did not manufacture. You refund money like this out of profits. If you have any. I can also see why Joe didn't have profits in 1982.

"We sold LNAs at the show (a specific show) **for $25 above cost"** Joe related. We asked how he could do that, $25 over invoice cost. **"I didn't have to inventory them.** The manufacturer brought 50 to the show. They carried them, stocked them in their booth, and I sold them from my booth. I made $25 each time I turned one." Right.

I recalled another conversation with Dave McClaskey of Intersat. The subject was dealers who ask to get equipment COD, or who plead and beg for an emergency replacement because a 'system is down.' **"There is a sham out there; people have figured out how to beat**

COOP/continues page 100

WITH THESE UNIQUE FEATURES THIS TVRO IS TOUGH TO BEAT



Micro Grid reflector features 55% open area for less wind loading. Reduces weight by two-thirds over conventional fiberglass antennas.

Aluminum Micro Grid reflector surface is accurately prebonded at the factory to high strength aircraft grade aluminum alloy frame... eliminates hours of field assembly required by comparable "mesh" dishes.

Durable polymer coating for years of maintenance free service. Won't rust!

High-performance Polarotor I™ feed horn. Receiver automatically switches polarization.

Pier-type polar mount with a safe 36 VDC motorized satellite selector.

Easy-to-handle, easy-to-ship. Freight charges substantially less than comparable 12-foot and 10-foot dishes.

12-foot antenna provides 42.3dB gain for picture perfect satellite TV reception. Meets 2° satellite spacing requirements.

Installation time less than 3 hours for 1 man when using single pole mount and "Quik-Rok" fast setting cement.

Top-quality 120°-degree LNA. Lower degree models available.

Model DE-2001 (components available separately)

Remote control optional

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One-cable from antenna to receiver incorporates actuator control cable, Polarotor I™ cable, 15 VDC cable for downconverter and LNA and cable for remote tuning meter.

Satellite selector provides preselection of two favorite satellites for quick realignment while also allowing variable selection of the entire satellite spectrum.

Polarotor I™ LNA vertical and horizontal polarity control with skew adjustability for different satellites.

Contemporary styled receiver with built-in modulator.

Conifer Corporation has been built on many successful years in electronics and antenna engineering and manufacturing. With Conifer you get convenient credit terms, on-time deliveries, full promotional support, one year warranty, and a company dedicated to providing the best price value in the TVRO industry.

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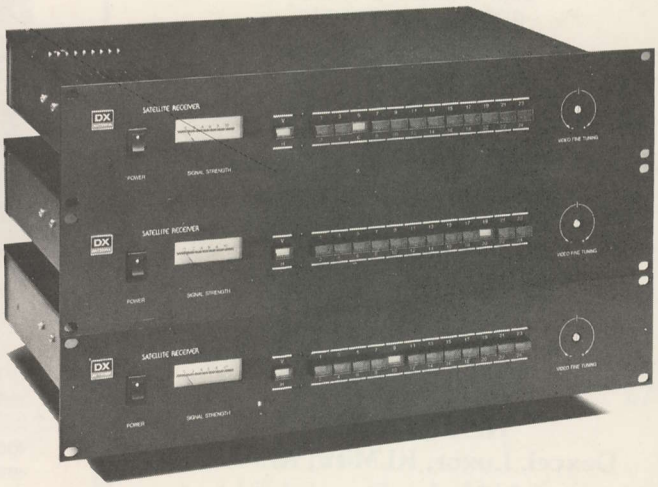
FOR ALL SMATV APPLICATIONS
FROM PATMAR TECHNOLOGIES

The Harris 3 meter Delta Gain Antenna combines the low weight and wind resistance desirable for SMATV installations with the high gain associated with much larger antennas. At the same time, its "deep dish" design with an f/d of 0.25 and modified Cassegrain monopod which shrouds the LNA's and feed assembly results in less terrestrial interference, low noise temperature and reduced side lobe interference. It also protects the LNA's from weather and theft.

It is available in both AZ/EL and Polar Mount configurations.

In cases where two or more satellites need to be accessed, multiple Harris antennas are cost effective compared to larger antennas with multi-beam feeds and will continue to work at tighter satellite spacings.



The DX Receiver and Block Downconverter is a commercial grade product with unique features for the SMATV industry. It enables the stacking of multiple receivers with the use of only one downconverter per polarity and the use of RG/59U coaxial cable instead of ½" heliax, making the cable run from the antenna to the satellite receiver and MATV head end much less cost and labor intensive. It also eliminates the need for ferrite isolators and expensive power dividers. The receiver returns to the original channel frequency in cases of power fluctuations or outages.

The output frequency of the block downconverter is 0.9 to 1.4 GHZ and its working temperature is −30° to +50° Centigrade.

Patmar Technologies also offers a complete line of SMATV products such as LOCOM LNA's and the SMATV and MATV products manufactured by Blonder-Tongue Laboratories including the ESM modulator for adjacent channel applications.

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Peter Sutro or Bill Heavener, 6 Claremont Road, Bernardsville, N.J. 07924 (201) 766-4408

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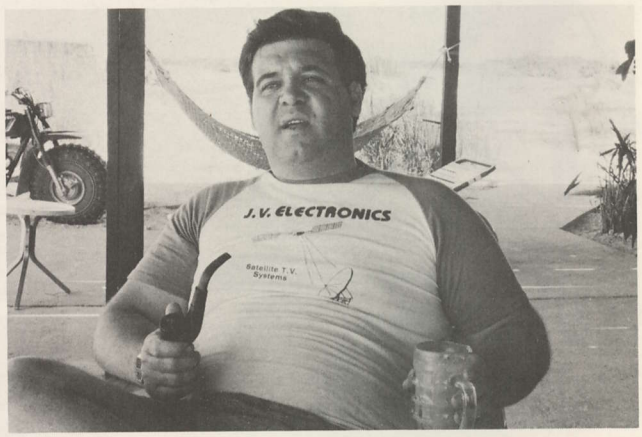
the COD thing" David told me. Then he wove a tale of how it is possible to snag a portion of a COD shipment out from under the watchful eyes of the delivery company. I was amazed at how the sham worked. Downright clever is what it was. The bottom line was that the shipping company (such as UPS) would eventually return a **portion** of the shipment to Intersat, with the notation that it had been refused. Right again. PART of it had been refused. The other part 'disappeared' because the clever dealer knew how to manipulate the delivery company driver.

The same McClaskey told me about how a big-time chain store for whom Intersat manufactures gear was a problem. "**One of their outlets** has several of our antennas. They kept claiming the antennas were bad and because they were a new account and a big one at that, we kept sending replacements. The 'bad units' never found their way back to St. Louis. This year, 12 months or so after this happened, I ran into this dealer at a trade show. "**I still have those bad antennas'** he said to me. I asked him what he was going to do with them. He smiled and said "**Aww, you don't need them back. I'll just keep them.**" Right. Again.

There is a pattern here which is disturbing. The OEMs and distributors are very vulnerable to criticism. They are immediate 'bad guys' if something doesn't work, or if there is not immediate restitution for something that malfunctions. The dealers bad mouth the distributors



VALENTINO ON PROVO/ 'vintage' T shirt.

or OEMs and sooner or later (typically sooner these days) **CSD** gets a letter charging the supplier with mail fraud or whatever.

The OEM, or distributor, on the other hand, is very reluctant to blow the whistle on a dealer. He figures that he is bigger than the dealer, and it looks like the big guy is attacking the little guy. It is always better, for PR, to be on the attack when you are the 'little guy.'

What may be missing in the industry is a central clearing house for credit. An agency that simply collects information, provided by distributors and OEMs, and stores it away in one of those nasty computer machines.

The machinery might be complicated to implement, but since it has been done in dozens of other industries with high success, it could be done here as well. The object would be to simply 'warn' distributors or OEMs that a specific dealer is a bad apple who engages in one type or another of deceit when placing an order. For a system like this to work in this industry, at least one OEM or distributor would have to be a guinea pig for each bad apple dealer. Somebody would get burned, and that information would go to the central agency. Now others would find out in advance of getting stung themselves.

Through all that Joe says he has been through, and through all that several dozen others have shared with me, I am convinced that this 'good guy/bad guy' labeling that we hear bantered about the industry is very much a two-way street. Yes, **there are** OEMs and **there are** distributors who always try to do a number on unsuspecting dealers.

But, there are also dealers who are just as conniving.

If increased visibility for poorly designed products is here (through the pages of **CSD**), there needs to be a counterpart system for increased awareness to the OEM and distributor that certain dealers are playing a 'cheating game.' For now I am satisfied that if we pinpoint the problem and air it here, that some clever business person will pick up the ball and run with it. I would editorially support a properly designed and properly run 'credit information agency.'

Joe Valentino, meanwhile, is a distinct problem. Joe is not the first distributor to lose money. He is not the first to go out of business as one entity and reappear as a new entity. What he is doing, however, is very visible. He freely admits that some people bought from him, and because of dealer cheating or OEM conniving, he got stuck in the middle. **JV Satellite** sounds very much like **JV Electronics** to me; I doubt anyone will be confused by the name change. And if it helps Joe get back on his feet, it is probably far better to keep Joe in business and alive, so that someday he can make restitution for those problems that **he caused** (as opposed to problems he got stuck with because somebody else screwed up).

With Joe's statement that he will be working to straighten out those legitimate claims against JV Electronics, I have decided that **CSD** will continue to accept his advertising. **But,** as I have warned him, **the minute the letters start to pile up from people** who are having problems with **JV Satellite,** I will be forced to re-visit that decision. JV Electronics is past tense. JV Satellite is present tense. Now we all know this and those who feel they need to be warned about such things have indeed been warned.

NOT Illegal?

Way back in November of 1979, the Federal Communications Commission decided that there was no longer any need for people installing TVROs to have an FCC license. They did this not because the home satellite industry was important to them, but more because the cable industry and the radio broadcasters were talking of **thousands** of new terminals per year, and the FCC was faced with the lengthy, and expensive-to-government procedure of processing each of these ARO (audio receive only) or TVRO terminals for a license. The FCC simply did not want to get swamped with license applications, so they re-thought their rationale for requiring a license and decided that a license would henceforth be 'optional.' You could spend the $1200 or so to file for and obtain a license, if you wished. Or you could do it without a license. If you went through the licensing procedure, you were actually 'staking a claim' to ARO or TVRO **service** in your area, **without terrestrial interference.** The whole licensing process, initially, was designed to insure that the terrestrial users of 4 GHz, and the satellite or space users of 4 GHz, could co-exist using the **same frequency bands.** A TVRO or ARO license, granted, insured that no future terrestrial networks would be built 'on top of you.'

In that fall of '79 ruling, the FCC talked about the then virgin but growing 'home TVRO' field. They made some comments about 'illegal' (i.e. unauthorized) versus 'legal' (authorized) reception, and promised they would re-visit that subject 'soon.' Well, soon just happened. But not without some prodding.

I understand that some buyers or would-be buyers of home TVROs have been concerned about the 'legality' of owning a TVRO. I further understand that some of these would-be buyers have taken it upon themselves to contact their FCC regional field offices (there are 24 or so scattered from San Juan to Anchorage) for a 'professional opinion.' And, since they are apt to talk with a receptionist or a technician or a field engineer, or, the man in charge, they are apt as would-be TVRO buyers to receive a different 'official statement' about the legality of owning a TVRO from **each** FCC person they talk with.

SPACE, our trade association, has been concerned about this problem since a would-be buyer who gets a hold of an uninformed FCC person is apt to be told flatly 'NO, they are not legal.' You cannot blame the uninformed FCC person totally; there has been no 'official policy statement' from Washington, and left to make up their own minds about a controversial question such as this, the 'safest' thing to do for a government employee is to simply say 'No.'

Not anymore. SPACE has been after the Washington headquarters of the FCC and they have just released a relatively detailed

Paraclipse™

HIGH PERFORMANCE SATELLITE TELEVISION SYSTEM

Survival of the Fittest

Success in the satellite television antenna jungle has gone to the strongest, most efficient, affordable and prolific design available; Paraclipse.

We've earned our success by offering a product of consistent high performance, structural integrity, operational simplicity and availability. The Paraclipse 12 (3.8 meter) is simply unsurpassed in overall performance and value.

A New Generation

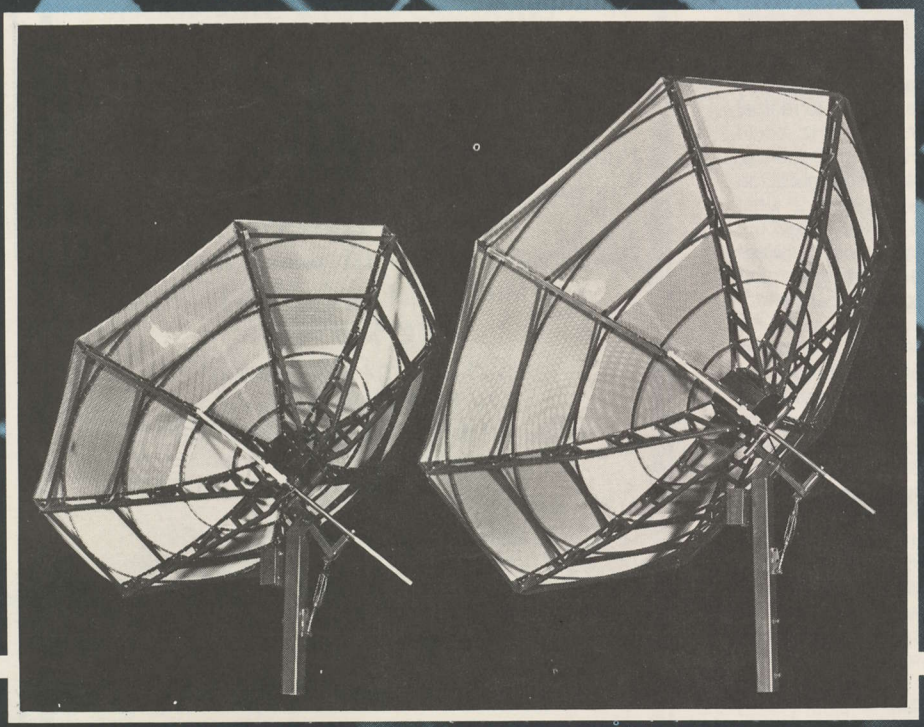
The TVRO industry is experiencing a period of phenominal growth and it seems that hardly a week goes by that someone doesn't introduce a revolutionary new antenna. This week it's our turn. We call it the Paraclipse 2.8 meter.

More evolution than revolution, in that it is derived from the same design concepts and is engineered to meet the same performance criteria as the original Paraclipse 3.8 meter. The new Paraclipse 2.8 is designed to bring satellite television to an even larger audience.

Natural Selection

We've refined and condensed a very successful design, maintained all the performance characteristics and construction standards of the original and made it easier to own. The Paraclipse 2.8 is lighter, easier to install and operate, and stronger than the 3.8.

Our ingenious new hub design makes assembly easier, increases structural integrity while it reduces weight. In every aspect, from manufacturing to marketability, the new Paraclipse 2.8 represents excellence in engineering and performance.



System Performance

Maximum performance from any satellite antenna is achieved in direct proportion to the antenna's ability to maintain the symmetry of its parabolic shape. Our welded aluminum truss construction consists of 8 rib trusses bolted together by a series of concentric ring trusses. This rib and ring design guarantees true parabolic integrity in both directions. When assembled, the Paraclipse system is so strong and distortion free that it easily out performs larger, more cumbersome equipment.

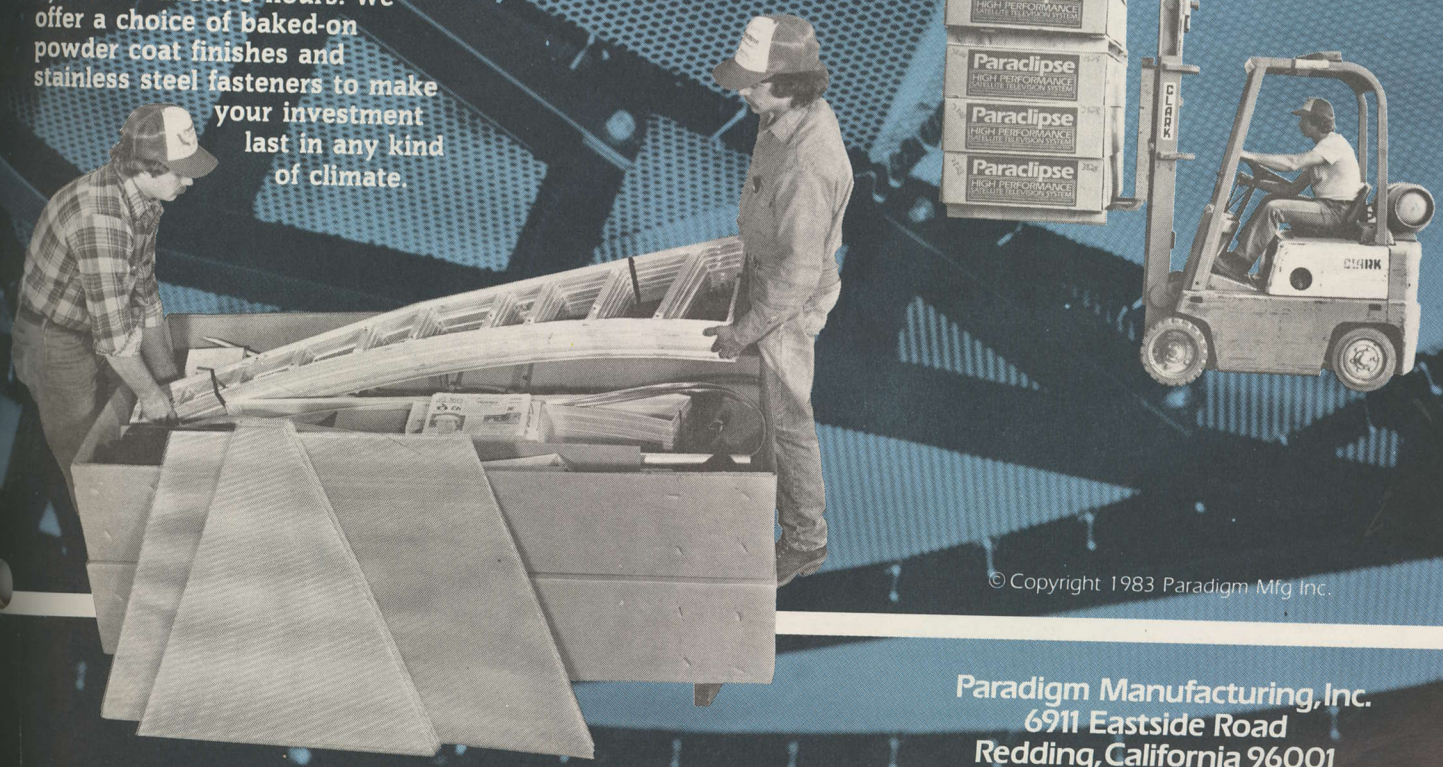
Adaptation to Environment

In a broader sense, our antenna and manufacturing capabilities offer the enterprising business person an excellent opportunity to develop new markets. Our equipment really makes sense when you are faced with a difficult or remote installation. The Paraclipse 2.8 weighs 230 pounds and the 3.8 weighs only 365 pounds ready to ship. Two people can assemble, install and tune a Paraclipse System in about 8 hours. We offer a choice of baked-on powder coat finishes and stainless steel fasteners to make your investment last in any kind of climate.

Paraclipse 2.8 and Paraclipse 3.8

We're proud of our products and proud of our position in the industry. We know the only way to stay ahead of the competition is to be ahead of the competition. We feel the new 2.8 is a major step forward. If you have questions about dealerships, pricing or delivery, please call us.

PIONEER MEMBER OF SPACE



Paradigm Manufacturing, Inc.
6911 Eastside Road
Redding, California 96001
(916) 244-9300

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statement which officially sanctions home TVROs. The statement mentions that 'to date there have been no court cases brought against TVRO owners, dealers, distributors and manufacturers' and further concludes that **there is nothing illegal** about watching satellite TV, selling satellite TV systems, or manufacturing TVRO Hardware.

The statement **does** attempt to explain that under the 1934 Communications Act, certain types of communications are considered private. That's the 'Section 605' thing. This serves to put the public on notice that at least **some** of the transmissions found on satellite are considered private, or personal, material. And, interception of such transmissions, without prior approval is or could be a violation of Section 605. That's just common sense.

SPACE is to be congratulated for staying on top of this problem, and getting the ear of the Commission. Every dealer who is a member of SPACE should by now have a formal 'copy' of the FCC statement concerning 'legal reception.' If you don't, you probably are not a member of SPACE. That's your cue to get on the horn (202/887-0605) and join. If I were a dealer, I'd run off several hundred copies of the FCC release, and frame one in my showroom so anybody who questions your business activity can read for themselves that you are not in some sort of illegal business.

FN RESINS

I was recently told a story concerning a 12 foot fiberglass antenna which is too good to keep to myself. I will not identify the 'author' of this report except to note that this is the head of a company that produces fiberglass antennas for the home TVRO market. I've changed just a few circumstances to make it more difficult for those reading this to identify the source. The 'meat' in all of this is the detailed introspect one gets of the problems associated with fiberglass dish construction. Who told me all of this is not important.

"**We had the opportunity** to provide a dish to somebody important. This was to be a very special antenna; one that represented the very best of our skills and the best of our technolgoy. We decided to send the mount out for a special paint job. Normally we use zinc chromate followed by an oil based paint manufactured by Porter Paints. This has worked very well for us, and so far no problems with the antennas in hostile environments. We should have left a good thing alone!

"**This 'special' antenna** was primed with auto body primer. Then it was painted with Imron paint. This is classy, but it proved to be a disaster. We happened to paint a second mount the same way at the same time. It was installed as a 'show antenna' here at the factory. Less than six months later, we had to replace it; rust!

"**Our fiberglass man** was given the same word; this was to be the very best antenna we could produce! While the mount was getting prepared the work began on the dish.

"**We buy resin** from two suppliers; AZS, and, Koppers. On the day this special antenna was to be 'shot' the truck arrived with several barrels of Koppers resin. This stuff comes in a pretty blue drum with big labels all over it. The AZS resin, on the other hand, arrives in a re-used black colored drum that typically has dents on the drum and stenciled product identification.

"**The fiberglass man** was told this was to be a special antenna so he does the logical thing; he gets the pretty blue drum and starts to spray. Since the drum just came off the truck an hour or so ago, it doesn't need to be 'stirred.' That's a 45 minute wait for the stirring, and he saw no reason to do that.

"**Just for the record,** resin, like bug spray, and many other products is 40% active ingredients. The rest is 'filler.' In the case of most resins, the filler is a form of Carbosil. And, Carbosil has a number of ingredients in it including powdered glass. Because filler has a lower specific gravity than the active components, the 'filler' will tend to rise to the top of the drum/mixture. When you stir this top layer it will appear to be thick and soupy, while the bottom is thin and runny. This bottom layer is the active chemical that makes the stuff actually gel.

"**Now then,** the drum that came off the truck (the pretty blue drum) was 'new,' and it didn't need to be agitated; right? **Wrong.** There is no telling, unless you can read the code that Koppers puts on the drum, when this resin was actually made. The Koppers stuff is made on the opposite side of the USA from us and shipping does use up some time. The AZS stuff, on the other hand, is made quite close by. Normally if we use it promptly we do not have to agitate it since the resin takes a couple of weeks to 'settle out.'

"**What all of this leads to** is that the 'special antenna' was made with the highly concentrated 'pure stuff' at the bottom of the drum (the chopper gun sucks up the stuff at the bottom of the drum first).

"**This all turned out to be a disaster;** but an interesting disaster. One of the ways to save money in a fiberglass operation is to use filler to stretch the resin out. Here we had an antenna with the exact opposite; it has no filler in it! The 'special antenna' left the factory and was installed before we figured any of this out. The mount had a beautiful auto body Imron paint finish over auto body primer; and the dish was formed with almost 100% 'good stuff'; no filler at all!

"**The dish went in** and worked quite well, **for awhile.** Then it began to 'sag.' That problem may or may not have been related to the strange 'mix' of the resin and fillers. It did provide us with an accidental opportunity to evaluate the long term stability of the 'pure' resin. How well will it stand up to UV (ultra violet) radiation, for example? What about becoming brittle? The fillers, improperly used, cause the antenna surfaces to become brittle."

Taylor Howard remarked to me, recently, that **he** felt the days of fiberglass dishes were numbered. Apparently Tay feels that the economics of fiberglass, plus the shipping problems that are inherent with such (relatively) heavy dishes (or pieces of dishes) is 'handwriting on the wall.' I'm not sure I totally agree, although I do know that if you took the 'average' or mean of antenna performance for all antennas now being sold, you'd find that solid metal dishes generally average higher in performance than mesh or fiberglass, while structural integrity usually finds the open faced mesh dishes a poor third. The biggest problem with fiberglass, if there are problems, is in the composition of the fiberglass sections. If they are not done properly, the poor guy in the field has a very bad time trying to get the pieces to fit properly. That's not a blanket indictment of all fiberglass antennas; some go together beautifully. And work just as well. But a poorly designed fiberglass dish, improperly manufactured, **is** a disaster.

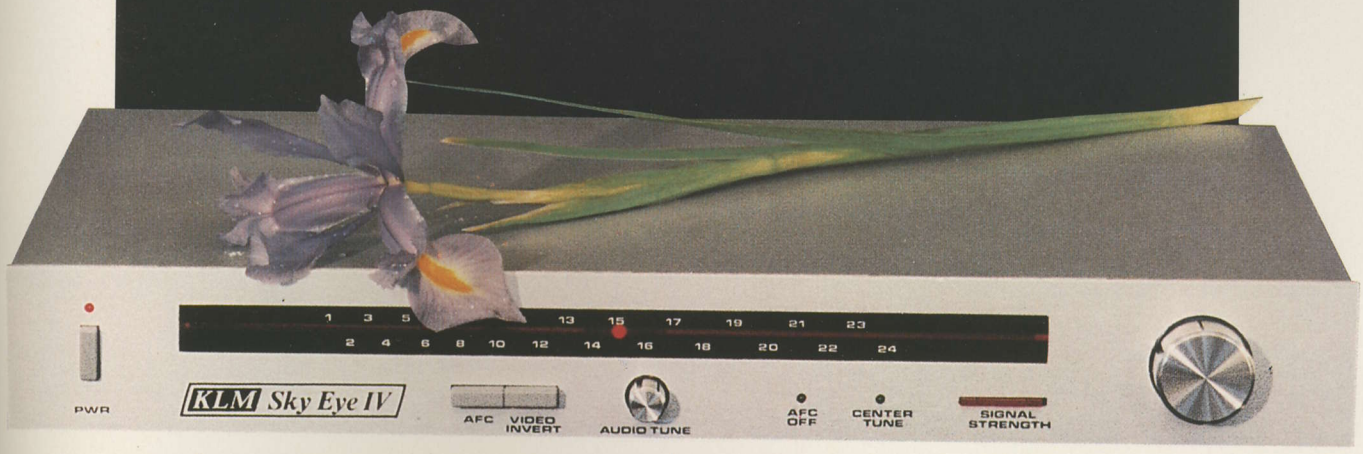
ROHNER Finally Gets It

Iowa Attorney General Tom Miller in mid-May filed a lawsuit against John and Georgia Rohner of West Liberty, Iowa charging that they had defrauded people who had ordered satellite television equipment from the Rohners. The suit was filed in Polk County District Court and names as defendents J.P. Rohner and Associates in addition to John and Georgia Rohner. Also named were two Rohner 'spin-off' firms; Satellite TVRO Technology (abbreviated STT; Rohner's deliberate attempt to associate himself with the well known STT firm), and Advanced Communications Engineering, Inc. According to the Iowa Attorney General, Rohner listed himself as President of each of these firms.

According to the suit, the Rohners and their companies were **"paid in advance for equipment which never was delivered, was delivered incomplete, or was delivered in inoperable condition".** The suit further charges that the defendents had repeatedly ignored requests from unhappy purchasers to either deliver operable equipment or make refund to the buyers. The State of Iowa is asking the court to force the Rohners to cease delivering TVRO equipment (within the State of Iowa; the limit of the State's authority), and to refund money to those who have purchased equipment. The suit lists some 36 complaints from residents of Iowa, as well as elsewhere around the country, totaling more than $45,000.

Any readers of **CSD** who have continued to have 'Rohner problems' are urged to contact the Iowa office of State Attorney General Tom Miller. The suit has been a long time coming, as older readers of **CSD** well know. **CSD** discontinued accepting Rohner associated advertising in the summer of 1980, and carried an extensive story similar to the present Iowa state case way back in the summer of 1981. In cases such as this, state agencies often move very slowly. For example, back on June 7, 1982 Iowa Attorney General Miller wrote **"It is the opinion** (of this office) **that Rohner and Associates has violated the Iowa Consumer Act** (714 16 Code) **and we anticipate filing a civil action against him for said violation".** Some 11 months later, such an action was finally filed.

You could spend more but you won't see a better picture . . .



KLM's Sky Eye IV Satellite TV Receiver

Superior design and engineering mean unsurpassed performance at a very reasonable price. Picture quality, electronics, ease of operation and installation compare with units costing much more. The **KLM Sky Eye IV** features slide-rule tuning, signal strength LED bar, "Center Tune" LED, AFC and video polarity control, fully tuneable audio (5.5-7.5 MHz), and remote downconverter. State-of-the-art single conversion/image reject circuitry, with SAW filter, produces sharp, clean, bright video that makes even big screen and projection TV look better than you've ever seen it before.

Complete UPS SHIPPABLE systems, too

KLM's new high performance **X-11** antenna features slide-in screen panels and double-reinforced aluminum support ribs for high strength, low weight and windload. The matching **Polar-trak** mount delivers all the satellites, horizon to horizon. Motorized model with KLM's exclusive Tangential-Drive makes jackscrew designs obsolete. Switch satellites from inside the home with KLM's **Polar-trak** or **Memory-trak** remote consoles. X-11 antenna and Polar-trak mount can be assembled by two people in 2½ hours. Both are **shipped UPS!**

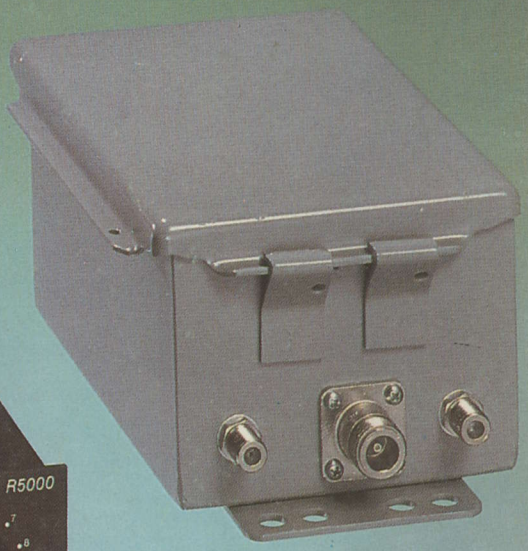
MADE IN U.S.A./ONE YEAR WARRANTY. KLM's receivers, antennas, and systems are built at its own manufacturing complex in Morgan Hill, California. KLM stands behind all its satellite TV components with a full 1 year warranty.

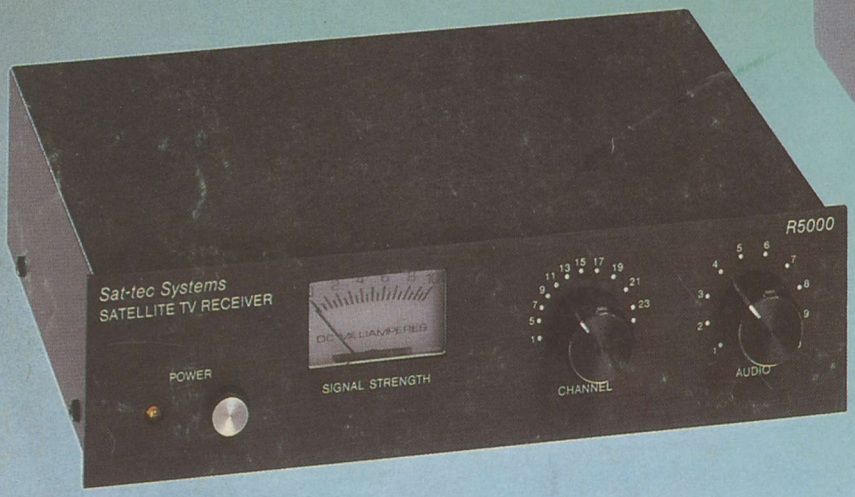
KLM electronics, Inc.
P.O. Box 816,
Morgan Hill, CA 95037
(408) 779-7363

Sat-tec . . . R-5000

The Leader in Satellite TV

Contemporary styling, state-of-the-art performance, down to earth pricing





Sat-tec's R-5000, a receiver designed for today's marketplace with tomorrow's features. Features customers demand, like; signal meter, contemporary styling, unexcelled picture quality, tunable audio, built-in modulator option, channel-lock AFC, baseband video output, rugged weatherproof downconverter, current limited "idiot-proof" hook-up, digital limiter/discriminator detector and reliable uni-chassis construction. Our years of accomplishments in the satellite TV industry has given us unique insight into reception techniques and customer demands. The R-5000 incorporates the latest technology as well as the subtle details that only experience can develop.

Extensive quality control checks such as our unique triple level board test, receiver burn-in as well as a final actual on-the-air check out assures reliability, for years to come.

The R-5000 — never has so much been experienced for so little. From Sat-tec, the name you've known first, since the beginning of Satellite TV.

Easy wiring is a Sat-tec exclusive, the down-converter can be up to 500 feet away from the receiver and only a pair of RG-59 cables are used — no troublesome multi-conductor wires or soldering! And, a real lifesaver are our current limited outputs, wrong hook-ups won't damage anything and there's not even a fuse to blow — it's the installer's dream!

Sat-tec Sales Incorporated

2575 Baird Rd., Penfield, NY 14526 • 716-586-3950